



FRIDAY, JULY 13, 1877.

The Tiffany Refrigerator Car.

Within the last few years a great deal of attention has been given to the transportation of fruit, game, eggs, meat, beer and other perishable articles, and several different kinds of cars have been constructed for this purpose. The business has become a recognized part of the regular traffic on a number of roads and has already assumed quite respectable proportions. The engraving of the Tiffany refrigerator car which we give herewith will therefore interest many of our readers. The principles upon which it operates are described as follows by one of the persons connected with the company which owns the patents:

"In the construction of refrigerating cars, chill rooms, etc., for the transportation and preservation of dressed meats, poultry, game, etc., there are three very important principles to be observed; and so far as art can devise the means of combining and applying these principles, will it be success-

brought thence into a summer temperature they go almost instantly to destruction. This is a standing objection made to the use of chill rooms for the preservation of perishable articles. If a temperature of 45 degrees, or thereabouts, can be maintained with moderate ventilation, this objection to the use of chill rooms would in a great measure cease; but when the temperature is carried down to 34 or 38 degrees, Fahrenheit, the article must not be subjected to a much higher temperature for any length of time before use.

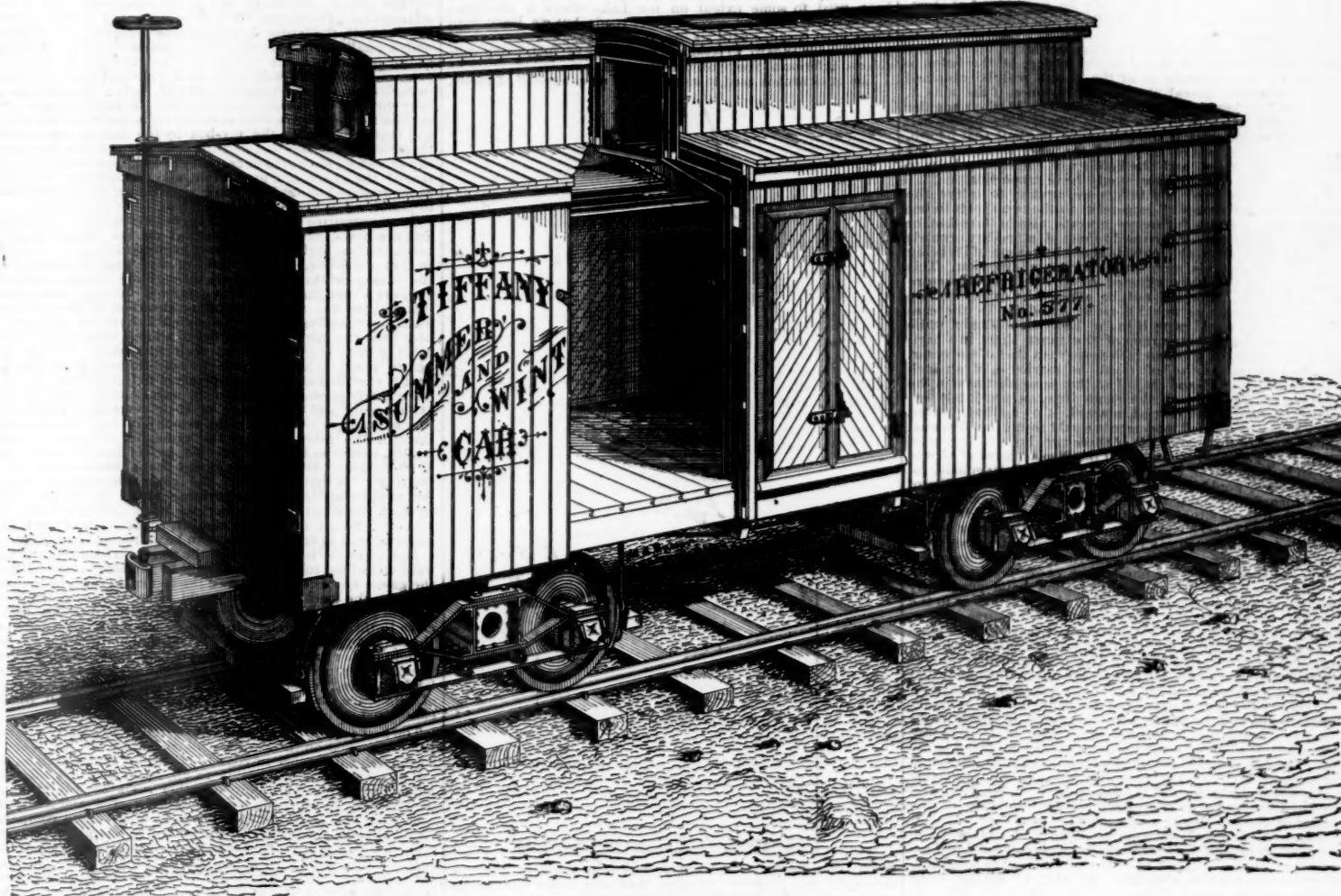
"There are cases where these principles cannot always be observed, and yet where cold storage is required. In such cases mechanical means must be employed to do what gravitation, if permitted, would do better. Cold air will not of itself rise above its fountain to displace warm and foul air; and if the cooling material be lower than some parts of the material to be cooled, the cold air will not ascend and do the necessary work unless mechanical means are employed to force it up. In such cases fan-blowing and other similar means are resorted to, and where these means can be relied upon at all times they may answer the purpose; but where the motion of the fan, etc., is contingent upon something liable to fail, as the motion of the car and the like, there is danger in trusting to it; for should the car come to a stand-still, the fan will come to a stand-still likewise, and the necessary work will not be done. But if the fan be carried by an independent power, which will go on whether the car move or not, there is less objection to it,

fluence of extreme low temperature in winter. This arrangement, it is claimed, makes this car peculiarly a summer and winter car—protecting the contents of the car from heat in summer and cold in winter.

This car is also provided with ventilators communicating with the horizontal air passages in the roof, discharging at the ends of the car through openings, shown in the accompanying drawings. The warm, foul air of the chamber is forced through these ventilating flues by the descent of cold air from the ice chamber into the body of the car, into the horizontal air passages already described as discharging at the ends of the car.

The bottom, ends, sides and top of this car are insulated from the influence of outside temperature by means of a series of confined air spaces, formed by the use of thin ceiling boards and felt paper. The number of these spaces is usually four, embracing the use of five coatings of felt paper and five thicknesses of ceiling lumber, said to make the walls, bottom and roof of the car almost absolutely impervious to the influence of the outside temperature, summer or winter.

A number of letters have been shown us bearing testimony to the successful working of the car, and as a considerable number are now in use, their success is now a question of fact and not of theory alone. Information concerning them may be obtained of the Tiffany Refrigerator Company, No. 74 Washington street, Chicago.



THE TIFFANY REFRIGERATOR CAR.

ful in the construction of cars and chill rooms fit to be trusted. "1. The temperature of such rooms should be reduced no lower than is necessary for the preservation of articles stored therein. An article which is safely kept at a temperature of 45 degrees, Fahrenheit, will be injured in its keeping qualities if it is subjected to a much lower temperature, say to 36 or 38 degrees, and will soon go to decay when exposed to the common summer temperature.

"2. The ice employed to give the desired temperature should be so placed as, by the force of gravitation only, to immerse the articles to be preserved in the chilled air. Gravitation is ever present, and will operate to give the necessary temperature while ice is maintained in sufficient quantities in its proper place, which is above the chill room, with means of interchange of temperature established between the rooms. Where artificial means are resorted to in the place of gravitation to do the necessary work, like fanning, blowing, etc., any accident suspending the operation of the mechanical means will defeat the purpose for which the means are employed. Consequently, the only absolutely reliable place to store the chilling material is above the material to be preserved, with the means of interchange of temperature between them.

"3. As far as possible, a moderate ventilation, supplying fresh, clean air, should be provided for the articles to be preserved. Every person almost has observed the value of *live* or *moving air* in the preservation of fresh meat and other similar articles, as compared with dead or confined air. Even timber will perish in a short time unless supplied with *live air*. At or near the temperature of freezing, meat and other like articles may be kept a long time without going to decay; but when

though then not as reliable as the force of gravitation for doing uniform and constant work.

"In respect to the first principle referred to, to wit, that the temperature should be reduced no lower than is necessary to preserve the article stored or being transported, the use of salt and ice to reduce the temperature to near freezing is very objectionable: (1) It is injurious to the keeping qualities of the article thus treated. (2) It requires double or treble the quantity of ice to do the work and at least three times the amount of attention, and considerable more expense than is necessary to preserve the articles in a much better condition, and for a much longer time. The condition of the preserving room should be as near as possible to that of a cool November day, with a gentle breeze, and the thermometer at about 40 to 45 degrees."

The construction of the car is as follows: The raised portion of the roof, or clear-story, as it has been called, forms an ice-box, which is filled from openings in the top without disturbing the freight. The air which enters the car is reduced to the proper temperature by passing through tubes under the ice, which are shown in the engraving.

The car is inclosed in a jacket composed of horizontal air passages, from end to end of the car. The object of this jacket is to cause a free circulation of air which has not been heated by contact with surfaces exposed to the direct rays of the sun, thereby cutting off the influence of the direct ray upon the chamber of the car—amounting, often, to a difference of twenty to thirty degrees of temperature. These air passages, being closed for use in cold weather, become insulated air spaces serving to protect the chamber of the car from the in-

MASTER MECHANICS' ASSOCIATION.

Tenth Annual Convention.

REPORT ON BEST MATERIAL, FORM AND PROPORTION FOR LOCOMOTIVE BOILERS AND FIRE-BOXES.

[Continued from page 301.]

STAY-BOLTS.

We find that, with three or four exceptions, all who have reported to us prefer a good quality of iron for stay-bolts. Steel has been used in a few cases. Mr. Charles R. Peddie, of the Vandalia Line, says: "I have tried stay-bolts of Otis steel in two fire-boxes. It worked well: requires more hammering to form a head than iron. I cannot endorse it without a more extended trial."

Mr. Jacob Johann, of the Toledo, Wabash & Western Railway, has used a soft steel for stay-bolts and gives it a preference over iron. Charles Graham, of the Delaware, Lackawanna & Western Railway, says that he uses iron for stay-bolts, but prefers a soft quality of steel; but gives your committee no reasons for such preference.

The difficulty in the case of stay-bolts does not arise ordinarily from tensile strain brought upon the bolt by the steam pressure, but from relative changes in the position of the two sheets through which the bolt passes, caused by a difference in the temperature of the two sheets, and the consequent difference in expansion.

For instance, if the side sheet of a fire-box expands in a vertical direction of $\frac{1}{8}$ of an inch more than the outside sheet, then all bolts in the top row will have their inner ends forced upward from their original position to that extent, and the bolts must spring or bend accordingly.

And when both sheets again become of the same tempera-

ture the ends of the bolts are drawn back to their original position.

Figs. 13 and 14 will serve to illustrate, that of No. 13 representing a section of the waterspace and sheets, and Fig. 14 an elevation of the side sheet; *A*, *B* and *C*, three stay-bolts in the top row, *B* being in the centre of the length of the fire-box, and *A* and *C* at the corners. The two sheets being riveted to the mud ring at *M*, a difference in temperature between the outer and inner sheets above that point would not change the relative position there, but the change would be from that point upward in proportion to distance and difference in the temperature of the two sheets. Now if that difference is such that the inner sheet, Fig. 13, will in the direction of its height expand say $\frac{1}{8}$ of an inch more than the outer sheet, then the inner end of the bolt will be carried upward out of their proper relative position, towards *D*, to that extent, and conform to the dotted line at that point, causing the bolt to spring or bend, or cause the outer sheet to spring outward at *E*, and inward at *F*, and the inner sheet to spring towards *G*, below the bolt, and towards *H*, above it, or all combined; each conforming to the forces applied to each of its parts. If the sheet is very heavy, or the bolt proportionally too small in diameter, all the spring or bend will occur in the bolt, and if the required spring is beyond the elasticity of the metal, it will be permanently bent upward towards *D*, and permanently bent back again to nearly its original position when both sheets become of the same temperature. From the nature of the case the greatest strain brought upon the bolt by these forces will be at the surface of the sheets in the waterspace. That at the surface of the thickest sheet will be the greatest, for the reason that that sheet will spring least, consequently the bolt must spring proportionally more, or bend; hence we find that in case of breakage it ordinarily occurs at the surface of the thickest sheet of the two. Now in the case of a stay-bolt situated say half way down in the fire-box at *I*, Fig. 13, the requisite spring of the bolt in the direction of *D* would only be one-half of that required of the bolts at the top, *A*, *B*, *C*, and not of itself sufficient to produce injury.

If the waterspace is large, in other words, if the bolts are long between the sheets, the requisite spring of the bolts to conform to the requirement of the sheets will be obtained without injurious lateral strain. For instance, if the bolts *A*, *B*, *C* were 5 in. long between the sheets, Fig. 13, their angular position with reference to the sheets would only be one-half that which would occur if the bolts were but half that length, the upward movement of the top of the inner sheet being the same in both cases, and the liability of the shorter bolts to break, over that of the longer, would be in proportion.

We have considered the influences tending to injure the stay-bolts by differences of expansion in the two sheets in but one direction. Those influences operate also in the other, or horizontal direction. If the inside sheet of a fire-box expands vertically more than the outside sheet by reason of its being hotter, it also expands more in a horizontal direction. This being the case, the bolts situated along the vertical centre line, as *B* in Fig. 14, would not be affected by expansion in a horizontal direction, as would those at *A* and *C*. In the case of *B*, expansion would carry it in the direction of *J* only, while if we assume that the expansion of the inner sheet in a horizontal direction is $\frac{1}{8}$ of an inch more than that of the outer, then the inner end of the bolt *C* will be carried $\frac{1}{8}$ of an inch in the direction of *P*, and that of *A* the same distance in the direction of *O*; while at the same time, as previously explained, they would be carried upward $\frac{1}{8}$ of an inch toward *K* and *L*. These combined movements would result in a diagonal displacement of the inner ends of these two bolts in the direction of *R* and *S* respectively, and if the displacement of *B* was $\frac{1}{8}$ of an inch toward *J*, then that of *A* and *C*, diagonally toward *R* and *S*, would be nearly $\frac{1}{8}$ greater, and the liability of upper corner stay-bolts to finally break off is proportionally greater than those situated at other points, length of the bolts being the same in each case. We find that the upper corner stay-bolts in fire-boxes break much more frequently than those situated lower down and those nearer the vertical centre of the sheets, and we also find in numberless cases, particularly in the upper rows, that upon close inspection bolts apparently sound show small cracks at the bottom of a thread close to the sheet part or all the way round, which in the course of time would go through the bolt. We find also that where a stay-bolt passes through a double thickness of sheet, such as a seam, if any considerable distance above the grates, it almost invariably breaks off in a comparatively short time, and that breakage always occurs at the face of the inside of the seam.

We believe the causes stated are those that operate in breaking stay-bolts, and the metal best calculated to stand these lateral strains referred to without injury is the best. Whether it be iron or steel, your committee are not yet prepared to decide. Toughness and elasticity are both requisite. To avoid breakage, it is important that stay-bolts be of reasonable length, particularly those in the upper part of the box, and that the diameter be proportionate to the thickness of the thickest of the two sheets, so that the bolt may have sufficient stiffness to cause the sheet to spring slightly in conformity to the lateral strains on it. Otherwise the spring or bend will occur entirely in the bolt, and in course of time end in breakage.

Owing to the expense of drilling, the plan of having small holes through the stay-bolts in parts where they are liable to break has not been generally adopted. The objection seems solely to the cost. We recommend the use of hollow stay-bolts at such points where they are liable to break as a precautionary measure, that breakage may be at once manifest by the leakage from the hollow at the ends, notwithstanding their increased cost.

FORM OF THE SHELL OF THE BOILER.

To the question as to the best form for the shell of the boiler for the ordinary eight-wheel American style of locomotive, we find that a large majority prefer the "wagon-top" pattern with one dome only.

The reasons are given that with this form more of the weight of the boiler is carried on the driving-wheels and less on the truck than in the case of a straight boiler. More steam room over the fire-box near where most of it is generated, and a better opportunity for cleaning the crown sheet of scale; and in case of bad water, or when muddy water is used in the boiler, it maintains its proper level better than in the straight form of boilers. These are some of the most important advantages claimed for the "wagon-top" form. The fact that this form of boiler has been so largely used, and is at present in use in fully as large a proportion of this style of locomotives as ever before, in preference to the more simple form of "straight boiler," would seem to be conclusive that, on the whole, it possesses some advantages not found in the other.

On this subject, we find some who differ in opinion from the large majority. Mr. Howard Fry, of the Philadelphia & Erie Railroad, says: "I consider all unnecessary distortions in a boiler bad. I have found straight-top boilers to steam as freely as wagon-tops, and to carry as dry steam. I therefore consider wagon-tops and domes unnecessary distortions."

Mr. Jacob Johann, of the Toledo, Wabash & Western Railway, states that he prefers straight boilers for all classes of engines. Mr. Peddle, of the Vandalia Line, says: "I prefer the straight boiler principally on account of its superior shape for strength, as I consider the flattened sides of the taper connection of wagon-topped boilers a source of weakness. I prefer a dome on the barrel of the boiler to take steam from, and a dome over fire-box to give steam room as well as to furnish access to the interior of the boiler over the fire-box for inspection of and cleaning crown

sheet and bars." The above are some of the reasons given why the straight-top boiler is preferable to the wagon-top. Your committee, at least a part of it, will not undertake to reconcile the views of Mr. Howard Fry and Mr. Peddle, quoted above, on the subject of domes on straight-top boilers, compared with one having none at all. It would seem that the objection to the wagon-top on account of the taper connection, as referred to by Mr. Peddle, ought not to be insurmountable or even serious. If the flat sides of the fire-box and the back end of the boiler can be securely stayed, it is not probable there would be much trouble in staying the connection referred to, if builders give the matter proper attention.

A majority of those expressing an opinion favor the straight-top boiler for the Mogul pattern of locomotives, and for the four and six-wheel switching engines; with the boiler made proportionately large in diameter to give ample steam room, with one dome; for the reason that this class of locomotives carry all, or nearly all, of the weight of the boiler on the driving-wheels, regardless of form, and the straight boiler being the most simple, and, if of proper diameter, will afford all the steam room required.

FORM OF THE FIRE-BOX.

Your committee have been unable to get any facts that would be considered new or valuable in regard to a beneficial change in the form of the fire-box that could be adapted to the present style of locomotive, from that now in general use—the plain rectangular form.

For burning anthracite coal, the long and comparatively shallow fire-box has been found to give the best results, and for bituminous or the semi-bituminous coals a deeper and shorter fire-box gives the best results, all things considered. For a time the "water leg" known as the "Jauriet fire-box" was largely used on some of our Western roads, but frequent and expensive repairs in keeping the fire-box in order, with a comparatively small saving of fuel, has resulted in its disuse.

That form of fire-box known as the "Weston" boiler has been used to some extent on the Lake Shore & Michigan Southern Railway and several other roads, but we learn from those most familiar with its use, that it has failed to meet expectations in regard to economy in the use of fuel, being considered inferior to the plain fire-box.

The brick arch is used to some extent on a number of roads,

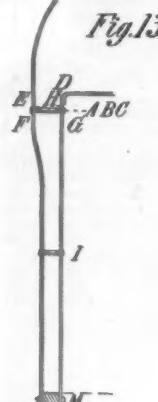


Fig. 13

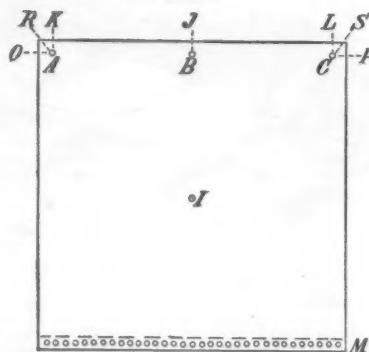


Fig. 14

sumed than we can under the circumstances that ordinarily exist in practice. To obtain all the work possible, out of a given quantity of fuel, is the object desired. If combustion of the gases in the fire-box is imperfect, then to that extent fuel and its value are wasted. If combustion is perfect, and the heated gases are drawn through the tubes so rapidly that the time is insufficient to allow the heat that the tube might otherwise take up to pass into the water, that also is a waste, and the remedy is to put in more tubes, and thus decrease the velocity of the gases through them. If large quantities of burned coal are drawn through the tubes, and thrown out into the air as sparks and dust, which in some experiments made a year ago by Mr. Peddle was shown to equal 10 per cent. of the coal put into the fire-box, then a large boiler, a lighter draft, and the intervention of a brick arch between the grate and tubes, increasing the distance through which the particles of coal must pass in order to be carried into the tubes, would to a great extent remedy the evil and result in economy.

The changes suggested would be correct theoretically, but in most cases, owing to the varying demand on the boiler for steam, good practice would show a compromise in the size of the boiler to be the best—one large enough for all ordinary demands, and yet quite small enough, at such times as an extraordinary demand was required for a few minutes at a time.

In answer to our question as to the proportions for a fire-box of a locomotive having cylinders 16×24 in. and driving wheels 5 ft. in diameter, to burn bituminous coal economically, the answers are quite uniform. With few slight variations the sizes recommended are: length of fire-box, 66 in.; height above the grate, 60 in.; waterspace at grate, one-half; give it at 3 in. and the other $\frac{3}{4}$ in.; space at top, 4 to 5 in.; length of tubes, 11 to $\frac{11}{2}$ ft.; diameter, 2 in.; number, 155 to 160; diameter of barrel of boiler at smallest ring, 48 to 50 in. The fire-boxes of engines that are reported as being the most extravagant in the use of fuel had waterspace from 2 to $2\frac{1}{2}$ in.

It is quite probable that the size of the fire-box will, to a certain extent, determine the most economical size for the waterspace. The larger the box and quantity of fuel in combustion in it, the larger the waterspace required, as compared with a small fire-box, would be the opinion of your committee; as the intensity of the radiant heat acting upon the sheets is proportionate to the body of the fuel (intensity being the same in each case for the same quantity of fuel). The passage of heat through the sheets into the water, in rapidity, is in proportion to the difference between the temperature of the water and that generated in the fire-box by the fuel in combustion; therefore the greater its intensity, the greater will be the quantity of water evaporated or carried upward, from the given surface of the sheet in a given time, and the quantity of cooler water required to take its place, and the required waterspace to permit a free and perfect circulation.

Your committee suggest no changes in proportions of boilers and fire-boxes, likely to be beneficial on the whole, except to call attention to the proportion of heating surface of the tubes to that of fire-box. We are of the opinion that in many cases the passage of the heated gases through the tubes is made in so short a time that much heat is carried through them that, if more time was allowed, would be absorbed by the tubes and water surrounding them. As stated before, the passage of heat from one medium to another of a lower temperature is, in point of time, in proportion to their difference. Now as the heated gases enter and pass forward through the tubes, the heat is absorbed and their temperature falls in proportion, and more nearly approaches that of the water surrounding the tube at that point and the passage of their remaining heat to the water becomes slower, while the velocity of the gases passing through the tubes remains the same for all parts of their length, except as it may be affected by condensation from loss of temperature, being to that extent less at the forward end of the tubes. If then in practice the gases pass into the smoke-box at any considerable temperature above that of the water in the forward part of the boiler, the tubes should be either increased in length or in their number, so as to hold on to the gases as long as any more heat can be extracted from them.

The lower the temperature of the water surrounding the forward end of the tubes, the more will be the heat extracted from the gases, and as a consequence the cooler they will be in passing into the smoke-box. It would seem, therefore, that our present practice of injecting the feed-water into the boiler close to the forward end (the closer the better) is correct in theory and good in practice. From the information we are able to gather on this point, we conclude that in most cases the present proportions of fire-box heating surface is not very far from being as good as can be adapted to our present style of locomotive under the circumstances of its use, all things considered.

The best proportion of grate for a given fire-box area will depend somewhat on the character of coal used, and as there is considerable difference in coal used on the different lines, we can fix no standard applicable to all, or to any considerable number of cases. Anthracite or other coals containing comparatively little hydrogen need more grate area and less total area of fire-box above the fuel, but more tube surface, comparatively, than in the case of coals containing a large proportion of hydrogen, for the reason that as the combustible part of the coal is mainly solid carbon, it is burned on the grate, and the combustion is nearly or quite perfect there; consequently there is nothing combustible at any considerable distance above the top of the fuel, and as there is nothing combustible remaining in the gases to prolong or further increase their temperature, their heat will be as readily imparted to the water through the surface of the fire-box.

On the other hand, hydrogen being evolved or separated from the solid coal before combustion, it must burn above the top of the fuel, and must unite with the proper proportion of oxygen before combustion takes place, and as the two do not mix rapidly, more or less time is required to complete their mixture, so that combustion may be as perfect as possible. Time and space being necessary, it must be provided in area of fire-box above the top of the fuel. If the area is large, the time allowed will be in proportion, and the passage of the gases through the space be proportionally slower. Also a less quantity of unburned coal will be carried to the tubes. It is important that the hydrogen, or rather carbureted hydrogen, receive its required oxygen at the top of the fuel, or as low down in the box as possible, that time for mixture and combustion may be given, either by a light or thin fire on the grate, permitting sufficient air to pass up through it to supply the demand, or by admitting it through hollow stays around the sides of the box.

The former method is doubtless best, provided the firing was always such as to admit the right quantity of air, as it is more evenly distributed over the whole surface of the coal on the grate than it could be if introduced around the edges. Gases and solid particles of fuel not consumed before entering the tubes are practically wasted, as contact with the surface of the comparatively cool tubes reduces their temperature below that of a flame, and they "go out." Therefore if we cannot induce perfect combustion in the fire-box, to that extent fuel is wasted.

If the fire-box is too small, sufficient time is not allowed for combustion before the gases pass into the tubes. If the area of grate be too large, the draft through the coals will be sluggish, and the oxygen of the air passing over the surface of burning carbon will unite with it in combustion, and, on arriving at the top of the fuel on the grate, no unconsumed oxygen is left to unite with the carburetted hydrogen evolved from the coal, which, if not supplied with air at some other point, and from another source, passes on unconsumed and is wasted. Careful tests, and comparisons of the performance of locomo-

mostly in passenger locomotives, and is as good, or perhaps better, for the purpose intended, than any other device. It renders its best service in locomotives hauling fast trains and worked up to full capacity, in preventing to a great extent unburned particles of coal from being drawn through the tubes, and it prolongs the passage of the gases from the coal to the tubes, reflecting heat back into the fresh and unburned gases as they ascend, assisting to ignite them as they mix with the oxygen that may have passed up through the coals unconsumed, or that is admitted above the top of the fire, and thus promoting and giving time for a more perfect combustion; the heated mass of brick acting as an equalizer of temperature. This, the oldest device for promoting combustion, is perhaps the best—at least as good as any other.

In the case of boilers that are comparatively large for the work required, it seems to be the opinion of a large majority, that even the brick arch is not economical, compared with the plain fire-box, taking into account the cost of renewals.

PROPORTIONS.

To our question, "Do you recommend any change in the proportions of boilers now in general use that will result in economy of fuel? If so in what particular?" we received no definite answer, other than suggestion that it might be beneficial to increase the number of tubes. It is important to know whether in practice we have the best proportions of boiler for a given size of cylinder. In our last report, your committee expressed the opinion that on this subject of the best proportions, there was less positive knowledge than on any other matter connected with the construction of the locomotive, and the result of our inquiry seems to demonstrate the truth of the assertion.

Are there proportions different from those in practice that would result in economy if adopted? is a question that has not yet been satisfactorily answered, and perhaps never will be entirely so, from the fact that in ordinary practice the demand on the boiler for steam is constantly varying. The demand for a few minutes may be its utmost capacity to furnish; then the next five or ten minutes, not more than one-half; the next five not a fourth, and the next ten, no steam at all may be required of it; so on through the whole trip. The demand being constant, and quantity the same for each minute during the time of work, then it would not be difficult to proportion and manage a boiler so as to obtain much better results from a given quantity of fuel con-

ives having different sizes of fire-boxes, yet doing the same work, and carefully noting the fuel consumed by each, would add much to our knowledge in regard to the best proportions. We find that the pattern and proportions of grate bar, and spaces between the bars, adopted by the different railway lines, differ to a considerable extent, due mainly to the difference in the character of the coals used, some form of the rocking or shaking grate being used in most cases. The thickness of the bars of the grate varies from one inch to five-eighths; and width of air space from one inch to three eighths of an inch. Some consider the use of a dead-plate occupying about 20 per cent. of the grate area at the front of the fire-box to be beneficial; while about an equal number consider it of no particular advantage. Both may be right, depending upon the proportion of fire-box to the other parts of the boiler, and somewhat on the character of coal used, and the work performed by the locomotive.

MEANS FOR PROMOTING A MORE PERFECT COMBUSTION.

To the question as to whether it is beneficial to admit air to the fire-box above the grate, in the use of bituminous coal, a large majority answer in the affirmative. Those who answer in the negative claim that in the use of fine grates, and by running with a thin fire, equal if not superior results are obtained.

Mr. Johann, of the Toledo, Wabash & Western Railway, says: "In my experience with the coal used on this division, it has been found that a sufficient quantity of air passes through the grate to effect complete combustion, and that hollow stays have a hurtful effect rather than otherwise."

Mr. Rufus Hill, of the Camden & Atlantic Railway, using a semi-bituminous coal, says: "Have experimented in burning smoke, and must say successfully, by admitting the air in furnaces directly over the surface of the fire. Dispensed with the use of the ordinary door and used an arrangement inside of fire-box worked by a small notched lever placed on fireman's side, or, in other words, an inside fire door. The quantity of air admitted in the fire-box, and the manner admitted, is a subject that has often been discussed, but from my experience I feel confident we can finally accomplish burning smoke, and save some fuel."

"The mileage of the engines experimented with showed an increase over the old door arrangement." Mr. Jas. M. Boon, of the Pittsburgh, Fort Wayne & Chicago Railway, says: "It is beneficial to admit air above the grate, about seven inches above the grate bars, on all sides of the fire-box." "We are using two square inches area of opening to one square foot of grate surface." "Believe better results would be obtained by more air openings, but cannot get more in."

Mr. Chas. R. Peddle, of the Vandalia Line, says: "I consider it an advantage, especially in diminishing the amount of smoke." "I consider the best point to put in the holes on the back of the box, say the fourth row of stay-bolts from the bottom, using tubes of 1½ in. outside diameter. This will bring the holes about twelve inches from the grate." "I think one inch area of opening to one square foot of grate will do very well."

Mr. C. M. Higginson, of the Chicago, Burlington & Quincy Railroad, says in regard to admitting air above the grate: "Decidedly yes. As close above the coal as possible on all sides. For locomotives the proportion of 'hollow stays' area to grate surface should vary with different coals, from one-sixtieth when the fixed carbon is 60 per cent., to one-fiftieth when it is 55 per cent. These proportions will vary for different coals, and each road can easily determine by experiment. It is safe to say that for Western coals one-fiftieth is a good working ratio." "We have used in connection with hollow stays, as above, the Jaunet water leg, and the brick arch." "The latter is the cheapest and gives the better combustion." "We use hydraulic pipe, with a hole ¼ in. diameter for the hollow stays." "In a 66 in. box we use three brick 4 × 9 × 33 to 36 in., placed across the fire-box." "They rest on tubes similar to those used on the Pennsylvania Railroad." "Many of our engines will give a uniform result of seven pounds of water evaporated per pound of coal burned." "The figures are reduced to an equivalent evaporation from 212° to equilibrate feed-water temperature." "Under moderately careful firing they make absolutely no smoke when working steam."

These are some of the replies received on the subject of the admission of air above the grate. Your committee do not undertake to harmonize the different views expressed by those believing that the admission of air at such point is beneficial and those who do not. The admission of air above the grate can be useful only in one particular, to furnish oxygen to unite with the gases evolved from the coal that otherwise will not receive it, and as a consequence pass through the tubes unconsumed, rendering no useful effect. An excess of air is harmful, from the fact that it lowers the temperature in the fire-box, to that extent giving back no heat in return, as only the requisite proportion of oxygen will unite in combustion with the carbonated hydrogen, and the excess of air, whatever quantity that may be, will not burn, but absorbs heat and carries it off. The quantity of gas evolved from the coal in a given time is constantly varying, in the usual way of firing a locomotive. For instance: after coals have been placed in the fire-box and subjected to the heat for a few seconds, the gas is evolved from it and the air passing up through the opening between the lumps and particles, it burns with a white clear flame, the combustion being then nearly or quite perfect. If air is then admitted in considerable quantities above the grate, it serves no useful purpose at that particular time, but rather the contrary. Then, in a few seconds more, several shovelfuls of fresh coal are thrown in, filling up or covering over the small air openings between the coal on the grate, cooling the interior of the box to a certain extent, and at the same time the gases from the fresh coal are evolved, needing a supply of oxygen, without which they will not burn. Yet that supply of air is to a great extent cut off at that particular moment by the closing of the openings from below, as stated; and if air is not admitted above the grate, in liberal quantities, combustion of the gases is not accomplished, or only in part, and the result is a cloud of smoke, until the greater portion of the gases is driven off, and air again finds its way up through the coals, to give the remainder of the gases the requisite oxygen for their perfect combustion, this operation being repeated every minute or two, or oftener, while running.

As about one-third of the heating value of bituminous coal is the combustion of its gases, it is of very considerable importance that it be accomplished with the least possible waste; yet the difficulties to be overcome, to accomplish that end, are greater than are generally acknowledged. The difficulties are in supplying the requisite quantity of air to the gases, at the right time and place, needed for their perfect combustion. If through the grate and the coals on it, we find that at the time that most is needed is just when it is the most difficult to get it in that way, and when the least quantity will be supplied. If through fixed openings above the grate large enough to admit the maximum quantity needed at a given time, then too much is admitted when the minimum only is required. If we depend for the requisite supply from both sources, the case is not altered in effect. Perhaps no better arrangement can be adopted in practice than a sort of compromise between admitting too much when the minimum is required, and too little when the maximum is needed. The area of such openings above the grate to accomplish that object best will vary with the kind of coal used, and can only be determined by test or experiment in each particular case.

Your committee are under obligations to Mr. Howard Fry, of the Philadelphia & Erie; Charles Graham, of the Delaware, Lackawanna & Western Railway; Jacob Johann, of the Toledo, Wabash & Western Railway; James Sedgley, of the Lake Shore

& Michigan Southern Railway; Charles R. Peddle, of the Vandalia Line, and others, for drawings and sketches furnished in explanation of matters presented in their reports to us, and in illustrating the different parts of the locomotive assigned us for investigation. Respectfully submitted,

R. WELLS, Master Mechanic Jeffersonville, Madison & Indianapolis Railway;

JACOB JOHANN, Master Mechanic Wabash Railway;

S. J. HAYES, Superintendent of Motive Power, Illinois Central Railroad;

CHARLES R. PEDDLE, Superintendent Motive Power, Terre Haute & Indianapolis Railroad;

N. E. CHAPMAN, Master Mechanic, Cleveland & Pittsburgh Railroad, Committee.

[THE DISCUSSION OF THIS REPORT WILL FOLLOW.]

MASTER CAR BUILDERS' ASSOCIATION.

Eleventh Annual Convention.

[Continued from page 302.]

The discussion of the report of the Committee on Train Brakes, postponed from the previous day, then came up in order.

Mr. FORD referred to the drawings of a brake made on the previous day by Mr. Richardson. One objection made to it was that the five cars to which the brake was applied would naturally close together, and then, if the engine should start before the brake was taken off, the effect would be to break the chain, which, he understood, was a ½ in. wire rope.

Mr. RICHARDSON said that this had never happened. They had had some trouble with the chain slipping back. On an ordinary car it cost \$10 or \$12; on a caboose, \$70. There is no need for slipping the wheels with it.

The following question was then read:

What is the best means for preventing end wear of the journal bearings?

Mr. AXLESLEY thought a good deal of end wear could be prevented by making the journals without a collar. He had had one car fitted up with collarless journals, lugs being cast inside the oil-box to take the end thrust. The car was running very well, but had not been out long enough to make a final decision.

Mr. WIERS said they had hundreds of such journals on the Atlantic & Great Western some years ago; they gave a great deal of trouble, and had to be changed at last. The trouble was that the journals would wear off at the end, about the thickness of a finger. He believed they were used on some roads under tenders, where there was less underpull than with cars.

Mr. HOPKINS had given much attention to this matter, and believed that end-wear could only be prevented by making very high collars, or by using stop-bars in the end of the boxes. Without these, on a road with many curves the end of the boxes would soon come against the hub of the wheel, causing a great resistance and wearing out the box. He had seen cases where the wheel was cut almost through a little away from the hub. The objection to stop-bars was that they were liable to get ground up. Mr. STEPHENSON, of New York, had applied for the reissue of a patent covering the use of the stop-bar, claiming that it was a necessity in horse cars. Where the lateral motion was received on the collars there was rapid wear of journals and an unpleasant motion.

Mr. MCILWAIN said that they were using stop-bars cast in the front end of the box, which was made heavy enough to resist. There was no friction, because the end of the axle has little or no motion at the centre.

Mr. HILL asked if the use of stop-bars did not make the pedestals stand out at an angle.

Mr. MCILWAIN said no. Their passenger cars were brought in at least once a year and the spread in the pedestals taken up, if there was any.

Mr. HOPKINS asked if the box worked up against the wheel, if that would not affect the pedestals also.

Mr. HILL thought it did, but not so much as the stop-bars. They had found their pedestals spreading and had attributed it to the use of stop-bars.

Mr. FORD thought it made little difference whether the end motion was taken up on the end of the axle or by the collar on the end of the journal. It did not throw the resistance much further from the jaw. The brass has got to take the lateral play against the end of the journal, the whole resistance coming on the jaw at last. It was a constant expense to take out the brasses because they were worn at the end.

Mr. MCILWAIN said they had not had a hot box in ten months on a car equipped that way.

Mr. HOPKINS said that at one time he had charge of the running gear of the coal cars on the Erie by contract. After many trials he concluded to use stop-bars altogether and after the first year he was able to cut down his price so that the care of the cars cost the company only about one-half the previous cost. In running the journal became an air-pump, drawing in air and dust and then driving out the air, but leaving the dust, and this made the journals wear very fast. As to the pedestals, when the thrust was taken on the end of the axles the pressure on the box was all outward; when it was taken on the brass there was as much pressure one way as the other, provided the brass was renewed before the box came up against the wheel. Mr. PULLMAN had concluded that his brasses cost him much less when stop-bars were used.

Mr. MORE had had much trouble with under-wear of brasses, and had not been able to prevent it. Their trucks were all hung with the upper ends of the hangers spread more than the lower, to prevent oscillation. It was also better because the bearings were further apart, making less strain on the cross timbers. They had a good deal of end-wear to their brasses, throwing back the end of the box too far. He thought they had made a mistake with their axle, in making it too short. It threw the hub of the wheel too far inward; it was almost impossible to keep the box from coming against the hub, unless the hub was set very far back.

Mr. WIERS said that they hung their trucks just the reverse way from Mr. More's, spreading the hangers most at the bottom. They had tried cutting off the end plate between the end piece and the spring beam.

Mr. C. E. GAREY thought much of the end wear was due to short curves. They had tried all three ways of hanging their trucks, spreading the hangers more at the top and at the bottom and hanging them plumb. When they were hung perpendicularly they gave a car uniformly level.

Mr. MONG said that the hangers were necessarily shorter in freight than in passenger car trucks. He used swing motion trucks with friction-roller side-bearings, and found them an excellent truck never getting off the track and having less end-wear of brasses. In answer to a question, he said he had not noticed much difference in the brasses between the swing and rigid trucks.

Mr. J. HILL said that on the Chicago, Milwaukee & St. Paul some years ago they had had the same trouble and finally tried concave journals with convex brasses, which proved very successful. They had also tried a sort of chain hanger, in three links, instead of the long hanger, and had found that work very well also, carrying the car very steadily.

Mr. ORRISON said that the concave journal had been tried 20 years ago on the Eastern Counties Railway in England and abandoned.

Mr. MORE asked how a car could be kept level when passing around a curve where one rail was elevated.

Mr. HILL said the motion was all in the truck, not in the body of the car.

Mr. HOPKINS said that in 1857, Charles Moran, then President of the Erie, brought from England drawings of a number of journals, including the concave journal. After careful investigation, however, they had concluded that there was nothing better than the straight journal.

Mr. CHAMBERLAIN could not see what advantage a chain hanger could have over a long straight hanger. The motion must necessarily be the same.

Mr. SMITH did not see the connection between the hangers and the end wear of brasses. He thought there was no way to prevent the wear.

Mr. SUTHERLAND thought that the hangers should deviate from a perpendicular line.

Mr. ORTON thought the brasses were not properly fitted. He always found them worn at one end more than the other.

Mr. CHAMBERLAIN thought the wear would be equal at both ends, provided the truck was equal.

Mr. HOPKINS had found that where the wheels on an axle were not exactly of a size the wear would be on the outer end of one of the brasses and the inner end of the other. He had also found that the flange-wear would be much greater on the smaller wheel.

Mr. L. GAREY said that on their street line they had tried journals without collars and various devices for taking the end-wear, but had given them all up and now made the collars as large as the axle would allow. They were then using on these street cars a journal 4 by 1½ in., and the bearings would not last over four months. They increased the size to 6½ by 2½ in., and the journals now run three and four years. He thought there was a close connection between the truck hangers and the end-wear of brasses; in a rigid truck the end-wear would be greater than in a swing truck. He had tried hanging the links plumb, but the motion then made the passengers sick. He stuffed the ends of the swing beam with leather and hair and then with rubber, but both wore out. He then drew his hangers in at the bottom, but the cars rolled so in going round a curve that ladies were frightened. For 12 years he had believed that the only point to put your hangers below the swing plank was as near over the rail as possible, that is, to take the full surface of the foundation upon which your strength rests. In that way your cars would not roll, would oscillate very little, and there would be very little end-wear in your journals.

Mr. MARDON said that passenger cars should be so hung that the weight of the car will overcome the side motion, and will bring the car to its place easily and naturally. With a properly constructed truck there would be much less end-wear on the journals than with a badly designed one.

The convention then adjourned until evening.

EVENING SESSION—SECOND DAY.

On the reassembling of the convention the special committee presented resolutions of respect to the late Aaron Steinbach, for ten years a member and Treasurer of the association. The resolutions were passed.

Mr. DAVENPORT stated, for the Committee on Improvements in Cars, that numerous circulars had been sent but no answers received. This he attributed to the depression in business and general poverty of companies.

On motion, the committee was continued for a year.

Mr. HEMPHILL said he would like to say a word as to the construction of cars, or rather on behalf of the trainmen. He referred to the dead-woods, or "man-killers," as some called them. If the committee would consider that subject and see if they could not be done away with it would be a good thing. He thought they were not necessary. If the draw-bar arms were not strong enough to take the concussion of the cars coming together, then they should be made strong enough. The lives of trainmen ought not to be endangered for the sake of a piece of wood or some strengthening of iron. He would also like to see a change in the ladders on freight cars, some of which were made without even a handle to go up the side of the car. He would like to see it a universal thing to put all ladders in the same place, at one corner on the outside. It would be a great benefit to trainmen. On his road more men had been disabled by the dead-woods than from all other causes of accidents combined.

Mr. ADAMS took exception to the plan of putting the ladder on the outside, instead of the end of the car, and mentioned several accidents he had seen, which resulted from putting the ladder on the outside. As to the dead-woods, he agreed that they were very dangerous. He thought that many had discarded them, but some car-builders still thought them necessary to protect the draw-bars. If they must keep the dead-woods then they ought to have a self-coupler. The Yardmasters' Convention, then also in session at Cleveland, had unanimously requested that dead-woods be dispensed with, and humanity should make them listen to that appeal.

Mr. FORNEY thought that the dead-woods were properly called "man-killers." They were an outrage on civilization and should not be permitted. He thought that if they had a general expression of opinion it would put a final end to their use. He spoke for the poor men who were exposed to constant danger and thought that the members would be exposed to the reproach of inhumanity if they did not speak out on this subject.

Mr. MARDON thought Mr. Adams was right about the ladders. As to the dead-woods, he was in favor of getting rid of them, but he wanted a draw-bar that they could feel some confidence in. If the draw-bars gave way the cars would come together. In the past few years there had been as many kinds of dead-woods tried as there were roads. On his road they used the old style, about four feet long, with blocks on each end; they were also running cars with simply a block that would strike in between the two blocks. He had long thought that this ought to be given up, but he also believed that if they were dropped the draw-bars must be strengthened. He was able to appreciate the danger to trainmen, having been once nearly crushed while coupling cars.

Mr. ADAMS said that the very arrangement just described was the "man-killer." If two blocks, not less than 5 in. thick, were placed over the end-sills, outside of all the draw construction, it would be safe for the man, would be perfectly solid and would not permit the cars to come together, unless the wood was smashed. If the bumper or draw-bar were knocked completely out, these blocks would still save a man.

Mr. MARDON said that he liked Mr. Adams' arrangement. He was not willing to trust to the draw-bars alone, but wanted those solid blocks on the end of the car.

Mr. ADAMS said that was what the yardmasters asked for.

Mr. DAVENPORT asked what had been the result with the self-couplers tried on the Lake Shore road? He had protested against the dead-woods before, and had had full opportunity to see the trouble and danger arising from their use. Of course they did not intend to rely on the draw-heads alone to protect the men. The safety blocks were a sure protection to the draw-heads as the "man-killers" were, and very much better for the men. With the safety block the man could step right up to his work and stand in the best possible position to do it. With the dead-woods he has to look where his feet are, and to see that his arm or body are not caught, to look three ways at once. He knew some car-builders were in favor of the dead-wood, to protect the draw-head. For himself he would prefer to put in a good heavy draw-spring and let that take the concussion, rather than have it right on the end of the car. The car would last longer.

Mr. KIRBY did not want to advertise any one's coupler. They had tried a good many, but the best was the one that members had seen on his cars that afternoon. With it a man had no occasion to go between the rails either in coupling or

uncoupling. Very often trainmen would couple cars while the train was backing and they sometimes got a heel caught in a frog or were thrown down and run over. With the couplers in question there was no need for men to run that risk. They intended to equip 100 cars with that coupler and to wait the result before making any further progress. With respect to the dead-woods he said two years ago that companies regarded the safety of their employees more than a few buffer springs. They used blocks 24 by 5½ in., giving 11 in. between two cars. He had fitted up a car with two buffer springs at each end, and, if at the end of a year the springs were in good condition, he should put double springs in all the cars he built.

Mr. L. GAREY said that the Yardmasters' Committee told him that they did not want self-couplers, but only some arrangement by which a man could be sure he would not be crushed when he went between two cars to couple them. If the car builders would give them dead-woods right over the draw-bar and not more than two or 2½ feet long, so that they could not be crushed, it would be a great kindness and would insure the safety of men coupling cars. The "man-killers"—the blocks on the ends of the beams some 4½ feet long—were sure to crush a man if the draw-bar gave way. He was surprised to learn that some roads were still putting on these "man-killers." He thought any master car builder who would put them on, except by positive direction of his superior officer, was not the man for his place. He could not believe that any of them were doing it. The dead-woods he was putting on were 26 by 5½ or 6 in., with the ends rounded, and that space was all the yardmasters wanted, if the draw-bars gave way.

Mr. HEMPHILL said that the springs need be made but a very little stronger to stand. The follower plates were generally too light on the ends. He used a full 6-in. follower plate and a pocket in the back end of the draw-bar, with the spring in between, and had had no trouble. He thought the dead-wood utterly useless for protecting the car.

Mr. VARNEY said his road was one of the oldest and had used dead-woods from the beginning. They were put on to save the men, and he thought that if every one used them fewer men would be hurt, and very few draw-bars broken. Their men felt perfectly safe with their own cars, it was only with foreign cars without the dead-woods that they had trouble. They could not get between them with only the 5½ in. space. On his ice-cars he had shortened the draw-bars all up and had very few broken now.

Mr. FORNEY asked whether a man was in position to handle the pin with the dead-woods, as he was with a single block over the buffers.

Mr. VARNEY said he had done it, but would not dare to do it again, unless the dead-wood was there. A man could go between them and get down the ladder with perfect safety.

Mr. CHAMBERLAIN asked what kind of draw-head Mr. Varney used.

Mr. L. GAREY did not doubt that the arrangement might do for the cars in local business on that road, but he would ask Mr. Varney for humanity's sake to change the arrangement on those cars which went to other roads, and put on the short block generally used. The men who coupled cars asked it, and they ought to be considered.

Mr. ADAMS said that some 400 railroads, with 70,000 miles of road, were asked to conform to a road 50 miles long. He believed that they were in duty bound to listen to the appeal of the yardmasters. He would vote for a resolution to reject all foreign cars having these "man-killers" on, and he believed that his company would sustain him. If a road wanted them on its local cars it could use them, but it ought not to send them to others.

Mr. MARDON spoke of the different kinds of dead-woods used, and thought they ought to agree upon some uniform style.

Mr. STEWART said that the thickness of the blocks, if a standard was adopted, could be changed without interfering with any one else. He would be glad to see the long blocks done away with. There were a few on his road, but he was changing them as fast as possible. As to the ladders, he was changing them to the end of the cars. They had no serious trouble with the draw-bars breaking. He believed in self-couplers, and asked the cost of the one Mr. Kirby was using.

Mr. SMITH hoped some one who was still using "man-killers" would come to the rescue of Mr. Varney.

Mr. J. B. HILL had some new cars with the dead-woods on them. Outside of them were two large truss rods coming through large washers, and with thick nuts on the end. What would become of a man when those thorns came together? They had the dead-wood on most of their cars and he believed that a man was much more secure with them in case of a draw-bar giving way. He thought he would keep on using the "man-killers."

Mr. L. GAREY said he understood those dead-woods were 12 inches apart, and asked what would be the outside measurement.

Mr. J. B. HILL said they were 20 inches over all. The block behind them was about 28 inches long. It was impossible for the dead-woods to get between them, they must come in contact. The cars in question were built for the Standard Oil Company.

Mr. VARNEY said their dead woods were four feet outside and the block about seven inches.

Mr. DAVENPORT said that he had looked at the cars mentioned with Mr. Hill. There was no necessity for that kind of thing; those draw-heads came through as Mr. Hill described. A little forethought would have shown the builder that as he took up 2½ inches of the space and made it unsafe to go in and uncouple, he should have added 2½ inches to the safety block. The Erie dead-woods were closer together than any that he knew of, and were the least objectionable he had seen.

Mr. FORD rejoiced to see so much kindness and sympathy for others, but he was on a road using those dead-woods, and he did not know that they killed more men than on any other road. If he wanted to kill men he thought he would leave off the dead-woods. He did not think it would be safe to leave them off on their line, for they had a draw bar that would not stand without a spring bunter; it was not strong enough. He would prefer a good, strong draw-bar, but he could not recommend the abandonment of the dead-woods without a change of draw-bar. He asked what could be done in such a case. If the old style had been uniformly followed there would be no trouble or danger. The blocks were above the draw-bar and a man could put his hand underneath to guide the link. He thought they were making a hubbub about nothing. When you had hundreds of cars it was a hard matter to make a change, but if something could be suggested he would be glad to hear it.

Mr. McILWAIN said he had a block six inches long over the draw-bar, and the draw-bars were strong enough to resist any ordinary concussion. He had often wondered why some roads retained the "man-killers," but now it was explained that the draw-bars were too weak. He would like to hear some further expression of those using the dead-woods.

Mr. SUTHERLAND said that he had spoken of this matter two years ago in New York. He had then said that railroad companies would be satisfied with nothing that would not dispense with links and pins and be a self-coupler. There was a lot of models there at the time and the belief was expressed that something practicable would soon be invented. He believed and hoped that it would be so. He further referred to the great cost of the coupling links and pins besides the damages that sometimes had to be paid for killing and injuring men. This matter of maiming and killing men was a serious business, to say nothing of the expense. Now if they found to-day a self-coupler that seemed to be operated with success so far as

tried, it would be a great economy to adopt it. Those "man-killers" were bad things, and if they kept on using them they must have a self-coupler, and he was glad to hear that Mr. Kirby was trying one with prospects of success.

Mr. HOPKINS said that about 1854 he had taken out a patent for a self-coupler. In trying to introduce it he had offered to one company to put in a number at his own expense and to take them out again if they were not satisfied after six months' or a year's trial. After repeated visits to the President that officer had told him that they would not pay out money for anything that would save the men's lives. If it would save the lives of passengers, for whom they had to pay when they were killed, they would adopt it. He thought the feeling now shown indicated a very gratifying change from that manifested in that President's remarks. He thought if some railroad presidents could have heard the remarks made in that discussion, they would be much surprised. Such a state of feeling was unknown 20 years ago. As to the Erie blocks, he had often coupled their cars and had found room enough. He did not think it was the best thing that could be devised, but it was not so bad as it had been estimated. It gave a protection which was not given by the dead-woods in the centre, as it left a place to put the hand and gave enough room. With the centre-block there must be a self-coupler or some arrangement by which a man could save his hand while guiding the link. He had seen a good many men's hands smashed in this way. The whole subject was well worthy of consideration.

Mr. KIRBY said that Mr. Wilson, of Pittsburgh, had seen the draw-bars he was using, and which they had that day inspected, and could make them by the hundred at \$12 a piece. He would guarantee to make them not to exceed 170 lbs. at seven cents a pound, which would be \$11.90, say \$12 each, or \$24 per car.

Mr. SUTHERLAND said that that was about the cost of the ordinary wrought-iron draw-bars. When the cost was even no serious objection could be made and humanity stood a fair chance.

On motion, the discussion was then closed.

(TO BE CONTINUED.)

Some Uses of a Railroad Combination.

Under date of April 15, 1876, Mr. Albert Fink, then General Commissioner of the Southern Railway Association, and about to resign his position, addressed a circular letter to the members of the Association, the chief part of which, except the tables, we copy below. These tables are statistics of the freight of different kinds shipped to and from each principal Southern town, with route and destination and quantity in each case, and the revenue therefrom:

The information contained in these tables is very important. For the first time, the exact amount and value of the business for which the associated roads compete is known, and the managers are enabled to estimate correctly the losses which they must incur by ruinous competition, and the net revenue which they may save to their stockholders by intelligent co-operation.

It is hoped such information will lead to a more judicious management of the competitive business than has heretofore been possible.

The following considerations will show what use may be made of this information:

All competitive struggles have for their object to secure to each transportation line a fair share of the business, or what may be considered so by each.

It is certain that any one line cannot expect to monopolize the whole. In the absence of all information regarding the exact amount of traffic in competition, or the portion carried by each of the competing lines, it is impossible for any one line to determine whether it has reason to be satisfied or should make additional efforts to secure more. Having no guide whatever to determine its policy in this respect it endeavors to get as much as it can, and in the general strife in which all engage for that purpose compensation for the work done is reduced to a point where the whole business is worthless to all.

The mode in which the competitive business between transportation companies is generally transacted is well known, but must be referred to here to show how little reason and intelligence, honesty and fairness is brought to bear upon the management of so important a property as that owned by the transportation companies.

A number of competing lines agree upon certain rates to be charged by each, and pledge themselves to strictly maintain the same. There may be some of the managers of these lines who honestly mean to carry out the agreement, but generally there are others who make agreements with the intention to break them, and merely for the purpose of taking advantage of the more honest.

There are other reasons not necessary to mention here which, under the present management of the transportation business, make it almost impossible to carry out the agreement in regard to maintenance of rates, even if all parties honestly intended to do so.

The fact that these agreements are hardly ever carried out has been fully established by past experience. The managers have no longer confidence that they will be carried out, and there seems to be a tacit understanding that agreements to restore and maintain rates, after a period during which low rates prevailed, are, in most cases, merely made for the purpose of practicing deception upon each other, starting from a higher scale of rates in order to secure, for a short period at least, some remuneration for the work performed, until the low rates are reached again in the natural course of events.

This mode of transacting business based upon deception and dishonesty has been elevated into a business principle in the management of railroad property, and is pronounced by many experienced railroad managers and general freight agents as the only possible or practical mode upon which the competitive business can be conducted.

It is hardly necessary here to remark that, if this be true, the proprietors of the railroads need not expect to derive much benefit from their property, especially during times when the transportation facilities of the country are so far beyond its wants as is at present the case. I believe, however, that it is possible to conduct this business upon correct principles, and thereby save a large portion of the railroad property of the country from ruin, which seems inevitable under the present system of management.

The first step toward that end has been taken by the transportation companies forming this Association, in securing a correct knowledge of the amount and value of the business which forms the subject of contention between the members of the Association.

It is shown in Table L. that during the year 1875 the gross revenue of the competitive business of the lines named in that table was, at the full rates agreed upon, \$1,451,315.16.

This amount of the competitive business may be considered as a fixed one; lower rates would not have increased it, provided the agreed rates were reasonable, and this was no doubt the case; but if not, then it would be to the interest of all parties to agree upon rates under which the largest amount could be obtained.

Estimating the losses which would have resulted to the stockholders under the usual system of management, we have first to consider the expenses of soliciting agencies, which, under that system, are unavoidable. They are hardly ever

less than 10 per cent. of the gross earnings; see report of South Carolina Railroad for 1875: "Foreign agencies, \$26,384.45, and total through business, \$234,861.25, or 11.23 per cent."

In the next place the rebates paid secretly, while pretending to maintain full rates, may be estimated at from 10 to 20 per cent., say an average of 15 per cent., making a total reduction of 25 per cent. of the earnings, even under the supposition that the parties pretend to maintain full rates.

But this make-believe is hardly ever carried on for any length of time. From the very nature of the transaction, low rates are soon reached, not unfrequently from 50 to 70 per cent. lower than the agreed rates. When this is done the payment of rebates generally ceases, but the expenses of soliciting agents continue.

Estimating the reduction of rates only at 50 per cent., and adding 10 per cent. for soliciting expenses, the loss of revenue during the period of low rates is 60 per cent., and during the whole period, forming a cycle in the history of railroad management, that is between the time of making two agreements, for the restoration of rates, the actual gross earnings will be as follows: During first period, 100—25=75 per cent.; during second period, 100—60=40 per cent., and average earnings, one-half of 115 per cent., or 57½ per cent.—or 42½ per cent. less than the gross earnings would have been, had the agreed rates been fully maintained and the necessity of soliciting agencies avoided. This 42½ per cent. is in many cases equal to the whole net earnings that could be derived from the competitive business, showing that this portion of the business is really valueless.

According to Table L., the gross earnings at agreed rates of the lines named in that table, during one year, were \$1,451,315.16, consequently the total loss in net revenue would be \$616,908.94 (it must be remembered that the loss in net earnings is equal to the reduction in gross), which loss is borne by the several companies proportionately to their gross earnings. The gross earnings reported here do not include the earning of the lines which are not members of the Association, but work with the same under agreed rates, nor does it include the gross earnings to and from points where there is no direct competition, but the rates at which points (and consequently the revenue) are affected by the competitive rates.

It is fair to estimate that the gross earnings from the competitive business (and consequently the estimated losses) under the system of underbidding are 50 per cent. more than here stated.

The competitive business of the Southern transportation lines named in Table L. forms only a very small proportion of the business which is transacted under the system of management to which I have referred, and which prevails more or less over the country.

An opinion may be formed from these estimates of the immense losses which result to the proprietors of transportation lines throughout the whole country, and less surprise will be manifested, when we notice the general depreciation of railroad property and the great number of railroads in the hands of receivers, unable to pay even interest on their mortgage debt.

The estimate of the average loss of 42½ per cent. on the competitive business is made on the basis fully explained above. I think the estimate is rather low, but those who are better informed can readily substitute their own figures in each particular case. It will be readily conceded that in no case under that system is this average less than 30 per cent. of the revenue that would be received if agreed rates were strictly maintained.

Now, bearing in mind that the sole object which each competitor has in view in thus sacrificing so large a proportion of its net earnings, is to secure a reasonable proportion of the business, it follows that if that object could be attained while the agreed rates are fully maintained, a large increase in the net earnings of all the competing lines could be secured.

Under agreements to maintain rates, even if they were honestly carried out, a satisfactory division of the competitive business (except it were by mere accident) cannot be expected.

It is impossible to predetermine the proportion of business that each line would receive under an advance of equal rates. Some inferior lines might not receive any, others a very small, and again others a very large proportion—perhaps one or the other might receive it all. A division of the competitive business between competitors left to chance or to the natural or made advantages possessed by the several competing lines will always be found to be unsatisfactory to one or the other, and lead to a violation of the agreement and to low rates.

We cannot expect an inferior line to maintain equal rates merely in obedience to an abstract principle when it cannot secure any business. To overcome this difficulty it has been the practice among competing lines to agree upon certain lower rates to be charged by the inferior lines. But it is found difficult to agree upon such differences in rates. They may not be made large enough to bring about the desired result, in which case the agreement will not be satisfactory to the inferior lines, or they may be made too great, in which case the stronger lines are not likely to adhere to them. In the absence of a knowledge of the exact amount of business received by each and the total amount—and under such agreements accounts are never kept—the decision is left to the judgment of the interested parties, and the conclusion is soon arrived at by one or more, or all, that they do not receive as much as they want. Expensive wars, involving millions of dollars of revenue, are waged to determine the exact difference in rates to be observed by competing lines to bring about a proper division of business. The difficulty is that none of the parties know exactly what portion of the business they could reasonably claim, much less do they know what they are actually receiving. In this crude way, all parties ignorant of the essential facts bearing upon the subject, important questions in the management of the great railroad property of the country are to be determined by its managers.

When we consider that the simple question at issue is to bring about a reasonable and fair distribution of the competitive business at remunerative rates among the various competing lines, the only rational mode of solving this question that can be suggested is for the interested parties to ascertain first definitely, by proper account keeping, what is the total amount of business in competition, then to agree upon the amount that each party shall carry, and then to ascertain whether this division takes place under the adjustment of rates agreed upon, and if not to readjust the rates from time to time, so as to insure the desired result. When this is done, all motive for strife and injurious competition is removed.

It will be asked: Is it possible or practicable to agree upon a fair or proper division of the competitive business? We know that it is possible to agree upon rates—not only possible, but absolutely necessary, if the competitive business is to be conducted at all with advantage to the transportation companies. Instead of agreeing upon the means to bring about a desired result, viz., a fair division of business, it ought certainly to be as practicable to agree upon the result first and then upon the means. This would not change the principle upon which competing lines now attempt to transact the competitive business, but merely the method, substituting a positive method for one which from its very nature cannot be expected to accomplish the end in view.

The question of making a fair and equitable distribution of business between competitive lines is not so difficult to determine as it may appear at first sight. It can be easily solved by

* During recent competition between trunk lines the reductions on established rates have been as high as 66 per cent.

applying to its solution the proper analysis of the facts that bear upon it.

Bearing in mind that it is not the largest amount of tonnage, but the largest amount of net revenue, that each competitor wants to secure, it can be readily shown that even under the most unfair division that could likely be made, the net revenue of the competitor least favored in such a division would be greater than under the distribution if it is left to chance and subject to the usual process of underbidding and deception.

A few general principles, that will be acknowledged as correct, will serve as a guide for a fair division of business.

These are:

First. No one of the competitors can claim to monopolize the whole business, and no one can be excluded from some portion of it.

Second. Lines of equal strength are entitled to receive an equal proportion.

Third. Inferior lines—and as such are characterized those that could not receive equal proportions of business with other lines at equal rates—should be satisfied with a smaller proportion than the stronger lines.

To illustrate the method in which these principles may be practically applied, I will assume that at a certain place four lines are competing for the same business. If they are of equal strength, each would receive 25 per cent. Supposing, however, that two of the lines possessed greater advantages, to such a degree that at equal rates they could secure nearly all of the business, but acknowledging the fact that the weaker lines must have a portion of it, they would be willing to allow at least 10 per cent. to each. This would leave 80 per cent. to be divided equally between the two stronger lines, or 40 per cent. to each.

The most unreasonable demands that the inferior lines could make would be to share equally or claim 25 per cent. The difference in this case between the maximum demanded and the minimum conceded would be 15 per cent. of the business. Estimating the actual cost of transportation at 40 per cent., the net revenue involved in the contest would be $15 \times \frac{1}{100}$, or a sum equal to 9 per cent. of the gross revenue. I have shown that under the present system of management the losses in net revenue may be estimated at 42½ per cent. of the gross revenue, but estimating the same only at 30 per cent., there would be a gain in net revenue to the stronger lines, even under a division that must be considered as unjust, of a sum equal to 21 per cent. of the gross revenue.

The question, therefore, which of the two plans of operation is the best, cannot be of doubtful solution.

In the application of the method here explained to the various cases as they occur in practice, it will be found that the extreme reasonable claims of competitive lines will hardly ever overreach the limit of 15 per cent. of business, or a net revenue equal to 9 per cent. of the gross revenue. It is, of course, not advocated that any one line should submit to injustice, nor is it expected that a fair division could be made in all cases by the interested parties themselves. But the division may be made by an impartial umpire. It would have to be palpably unjust and erroneous if it were to result in greater losses to any of the parties than are inevitable in case of open competition.

The objection that may be urged by some lines to the plan of agreeing upon or submitting to an equitable division of business by arbitration arises generally from the belief of its managers that they possess superior facilities or smartness in deceiving their competitors, and that thereby they may secure more than what might be considered by impartial judges their fair proportion.

A little reflection and consideration of the limits within which deception may possibly be practiced upon others will show that this theory is one of self-deception, and merely leads to decreased revenue, as compared with the results that are surely to be obtained under the proposed plan.

Under the most favorable circumstances—viz., during the time that the parties who act upon this theory are believed to act honestly, while they are paying rebates and others do not—the cost of purchasing business can hardly be less than 15 per cent. of the gross revenue.

The amount of business required to secure net earnings equal to 15 per cent. of the gross earnings (the operating expense being 40 per cent.) would be 25 per cent. Bringing into consideration all the soliciting expenses, which can be dispensed with under the proposed plan, the amount of additional business which must be secured to pay from its net revenue these expenses and the rebates—25 per cent.—would be 42 per cent.

Now, it is not reasonable to suppose that any line could secure, especially when there are more than two, so large a proportion over and above what would be considered its share by a fair division, without being suspected, discovered, and at last followed by the others.

It is well known that the general instructions which are given to soliciting agents, to do as others are doing, or supposed to be doing, are carried out with great alacrity by these agents, as their importance and occupation depends upon such contingencies.

Under these instructions the management of the competitive business is practically turned over to these agents, and the proprietors of the roads, or its managers, lose all control over it, and become mere figure-heads, as far as this important branch of the business is concerned, upon which, to a great degree, the financial success depends.

Under the management of the soliciting agents it is not long before unremunerative rates are reached, and estimating, as I have done, the losses in net revenue incurred thereby to all competitors equal to from 30 to 42½ per cent. of gross revenue that would have been received had rates been maintained, the amount of additional business required by any one line to make up these losses is from 50 to 70 per cent.

It is self-evident that it is impossible to secure such a large increase over a fair proportion to any of the competing lines by the most skillful maneuvering, and by the greatest art in deception.

It follows, therefore, no matter what view may be taken of the subject, that a fair and impartial division of business, by which the maintenance of remunerative rates is secured, will result to all competitors in the largest possible amount of net revenue.

The sooner this fact is understood, the sooner will the present disgraceful management of the competitive business be abandoned, and the sooner will the proprietors of the railroads receive a just compensation for the use of their property. While the proposition which I have endeavored to demonstrate mathematically may appear to many self-evident, yet if it were not for the hope that seems to linger in the minds of some railroad managers and general freight agents, that they could secure to their employers advantages over competitors and thereby increase their net earnings—a hope so illusive—the competitive business would have been before now conducted upon more correct principles, and with better results to all parties.

Since the Association was formed, the method of conducting the competitive business here recommended has been adopted and successfully carried out at several of the competing points. Accurate accounts were kept of the business transacted by each line, and from time to time directions were given through this office to lines that fell short to lower their rates, and to others that exceeded their proportion to maintain full rates, or to increase the same until the proper division had taken place. Where these directions were observed, no difficulty has been experienced, and the fact has been fully demonstrated that the plan is entirely practicable. I regret to report that at some

places all the lines did not obey the directions, in consequence of which the agreed division has not yet been brought about.

In all cases where the competition is confined to one place, from which the shipments are made, and this is the case with the east-bound business, there can be no difficulty in carrying out the plan. But when shipments are made from a number of places directed to any one place, as is the case with the south-bound business, it is more difficult to secure the agreed division by adjustment of rates, and it becomes then necessary to ascertain the net revenue that each line would have received had the proper division taken place, and guarantee to each line that revenue by payment of the balances that may arise, in cash. This plan was adopted in March last in regard to the merchandise business, and should be adopted in all cases where a proper division in kind may not be practicable, convenient or desirable.

The clearing house is now fully organized, and accounts can be rendered and balances settled on the 15th of each month for the business of the preceding month. I respectfully recommend this plan for general adoption by all the roads of the Association, and those that are working with them, as the only one under which the property represented in the Association can be made to yield the largest profit. I am satisfied from past experience that under no other plan can remunerative rates be maintained.

In the division of business, as well as in all other transactions relating to the competitive business, a number of questions come up that have to be carefully considered and impartially decided. The reports published for the year 1875, showing the amount and value of the transportation business at each place, will now greatly aid in making an equitable division. The organization of this Association furnishes the means by and prescribes the method in which all questions of conflict, no matter what may be their nature, can be justly and equitably decided; surely in a much more satisfactory manner than this could possibly be done by the usual mode of warfare, and the consequent reduction of the revenue to all parties. If the members of the Association will sustain its authority, comply with its rules, and adopt the plan of dividing the competitive business as here proposed and carry it out in good faith, they will secure, without a doubt, the largest possible net revenue to each company.

Objections have been made to the system of operations here recommended. It is said that the co-operation of competing transportation lines and consolidation of their interests, is against public policy. Whether this be so or not, depends altogether upon the object and result of such co-operation. If it resulted in unreasonable transportation charges and extortion, such combinations should, indeed, not be tolerated; but if their object be to secure to the railroad companies reasonable compensation for their services, and to the public reasonable and permanent rates of transportation, then such combinations cannot be considered against public interest.

It can be readily shown that the great evils of the transportation business arise chiefly from the strife and warfare between the transportation companies. This strife and warfare—generally called competition—possesses none of the legitimate elements of competition, but simply results from the want of proper management of an extremely intricate and complicated business, or from direct and gross mismanagement.

When railroad managers of competing lines establish certain competitive rates, and agree to maintain them, all the legitimate elements of competition are previously considered, and have had their full influence upon the tariff.

The cheap rates of water transportation exert their influence in reducing the rail rates from the Northern Lakes southward, from the Gulf of Mexico northward, from the Atlantic seaboard westward, and the Mississippi River eastward, until it is felt at the most interior points within the territory embraced between these waters.

The rivalry between commercial communities, each served by a separate system of railroads, exerts its influence upon the tariffs. The railroads whose interests are identical with the localities upon which they depend for business must adjust their rates so as to secure for them the full advantage of their position.

Enlightened self-interest requires that the tariffs shall be so regulated as to obtain, under their operations, the largest possible amount of business and revenue. All these elements enter necessarily into the formation of the tariffs. When they are once established, according to correct principles, and pledges are given to maintain them, the reductions which are subsequently made, through the desire of each competitor to obtain the largest share of the business, by a process of under-bidding, openly or secretly, and by the payment of rebates, or other means of deception, are not the result of legitimate competition. They are generally made in violation of the laws that should govern common carriers, and regardless of the cost of the service—they depending upon the degree of good or bad faith that may be practiced by the competitors. They result in favoritism, unjust discriminations, unreasonably low competitive rates, unreasonably high local rates, constant fluctuation in rates, and consequent changes in the value of articles of commerce, and cause disturbance of all commercial relations.

In addition to these evils under which the public suffers, the proprietors of the roads are deprived of their just compensation for services rendered. Railroad property, in which so much capital is invested by the people of this country, depreciates, or its value is entirely destroyed, and this again acts injuriously upon other industries, upon the credit, and upon the general prosperity of the country.

Can it be against public policy to adopt the only practical means by which these evils can be remedied?

To establish, regulate, and maintain, with some degree of permanency the transportation tariff of this country, with its 70,000 miles of railroads, and its many navigable rivers, is not a problem that can be solved satisfactorily in the interest of the people, and in the interests of the proprietors of the roads, by the disjointed and separate action of the individual carriers, and by strife and warfare with each other. Combination and organization is absolutely necessary.

Contributions.

The Translator of Weyrauch.

NEW HAVEN, July 3, 1877.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Mr. Van Nostrand, in his reply, June 15, to Mr. Merriman's card of June 8, introduces rather unnecessarily my name and makes statements which I cannot allow to pass without correction.

One of these statements has already been corrected by Mr. Merriman in the *Gazette* for June 29. It thus appears that Mr. Van Nostrand omits entirely to state that his arrangement with Mr. Merriman was conditional only and liable to the proviso "that the author's consent should be obtained." Without waiting for this condition to be settled he announces the work over Mr. Merriman's name. Mr. Merriman then withdraws, in accordance with the original agreement, because he learned that the author had made other arrangements. Compare this state of facts with Mr. Van Nostrand's omission of all mention

concerning the proviso and his statement that Mr. Merriman "wrote me that he intended to withdraw from his arrangement with me because he had learned that Mr. Du Bois had also commenced a translation. As soon as I received this information I put the work in other hands." The "arrangement" fell through by its own provisions. All announcements anticipating such provisions were unauthorized until the arrangement should have been consummated. It never was. At the suggestion of the author I had undertaken the translation before Mr. Merriman consulted Mr. Van Nostrand. It may amuse your readers to learn that after "putting the work in other hands" under the above circumstances, Mr. Van Nostrand claims an exclusive right in it by courtesy (?)—a courtesy he seems more ready to claim than to grant. Mr. Wiley's edition is the only authorized one, the author receives a copyright, and Mr. Van Nostrand's interference is seen by the above to be entirely uncalled for.

The second statement I wish to notice is with regard to Weisbach, "the assignment of a translation of which work had been made to me from the late Prof. W. both for this country and England, and of which I published Vol. I. some years ago." The last portion of this sentence is the only correct statement in it. The remainder I believe to be untrue. If Mr. Van Nostrand will show such assignment as he distinctly claims "from Prof. W.," I will at once apologize for my belief and even now, with the consent of my publishers, will withdraw from the work. The translator of the first volume had, as every one knows, the full consent of Professor Weisbach to translate as much of the work as he chose. He published jointly with Van Nostrand the first volume, it being distinctly agreed that neither party should be bound to go on with the work. He has long since made over to me any right or title he may have to all portions yet untranslated. Of this fact Mr. Van Nostrand was perfectly aware when he wrote the above misstatement. I claim therefore the assignment myself, and I hold it direct from Mr. Van Nostrand's own translator. He knows that I thus hold it. I will, however, at any loss, yield at once, as stated above, to the assignment "from Prof. W." which Mr. Van Nostrand says he holds, and thus set him a good example of the courtesy which he refuses to others. This offer remains open two weeks. Had he ever claimed and proved such an assignment, I should never have undertaken the work in the first place. It is singular, to say the least, that at this late hour we have the very first intimation from him of any such claim. Frankly, I don't believe it. As it is, I have undertaken the rest of the work with the full consent and approbation of the translator of the first volume, who long since informed Mr. Van Nostrand of his withdrawal in my favor. Now let Mr. Van Nostrand make good his words—if he can. If he cannot, I would suggest that he drop his dog-in-the-manger policy and confine his publications to such works as he has a clear title to. He would do well at any rate to confine his assertions within the limits of strict veracity.

With the exception of these two points, both of which are misstatements, there is nothing in Mr. Van Nostrand's letter especially worthy of notice. No one comparing the two editions of Weyrauch will hesitate to choose Wiley's. The list of errors printed last week by Mr. Rapelje will give some idea of the gross carelessness with which Mr. Van Nostrand's edition has been prepared and revised. If Mr. Rapelje had himself compared the two editions, he would have easily found, by simple comparison, three or four times as many errors as he has given. His own list needs correction. I advise no one to adopt it without verification. He does not appear to have seen Wiley's edition, or he would have known that it has tables for reduction and other useful "padding" quite as valuable, to say the least, as Mr. Van Nostrand's catalogue of publications. The points of difference pointed out by Mr. Merriman are all well taken and could be easily extended. A. J. DU BOIS.

[If there was anything right in the letter from Mr. Rapelje, it is to be wondered at. Intending to insure its accuracy, it was supposed to have been postponed for a week to give opportunity for revision by the author, comparison with the original German and the Wiley edition translated by Professor Du Bois, and the result was that it appeared without even the ordinary revision. Mr. Rapelje must not be held responsible for any blunders which his letter, as printed, contains.—EDITOR RAILROAD GAZETTE.]

A Misstatement in Mr. P. M. Arthur's Speech.

INDIANAPOLIS, July 7, 1877.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of June 15 appears a statement from P. M. Arthur saying that among the roads where he had brought about a peaceful adjustment of differences between the officers and engineers, by obtaining concessions on both sides, was the Indianapolis, Bloomington & Western Railway.

This is not the fact. Last December, after mature consideration, the Receiver ordered a reduction of 10 per cent. on all salaries and wages, and Mr. Arthur appeared and demanded the withdrawal of the order, so far as it concerned the engineers, in such a manner as to oblige the Receiver, General Wright, to decline to have further conversation with him.

A strike was then ordered, but seeing the folly and uselessness of more than a faint show of resistance, the men went to work at the established rates.

Had Mr. Arthur made any further trouble, he would have found himself in the clutches of the United States Marshal, by order of Judge Drummond.

To General Wright, the Receiver, to General Pease, the Superintendent, for their firmness and judgment, and to the engineers, for their good sense, and not to Mr. Arthur, is due the peaceful solution of the differences in that case.

RAILROAD.



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Editorial Announcements.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

COMPETING FOR BUSINESS.

The numerous railroad combinations recently entered into for the purpose, chiefly, of "maintaining rates" on the traffic of certain districts which is much competed for give special interest to the circular of Mr. Albert Fink to the Southern Railway and Steamship Association, issued about fifteen months ago, which we publish this week. This circular lays stress on the great advantage gained by a combination in enabling all who compete for a traffic to know just what they are working for—how much the total traffic is, what the gross receipts from it are, and how much goes by each route.

It might naturally be supposed that a railroad company would not maintain a costly establishment for the purpose of securing a share of a certain traffic unless it knew, approximately, what that traffic was worth. Much more might it be supposed that a company would never engage in a competitive struggle, by which its income for months might be seriously reduced, unless it knew positively that there was great value in what it was fighting for. But such suppositions would be mistaken. A railroad company very often fights bitterly for a share of a business when it does not know that it is worth much, and sometimes when all of it put together, or the largest share of it which it could hope to get, is hardly worth having. Indeed, it is not always possible to know how great a given traffic is. Half-a-dozen lines compete for a traffic, but they do not afford each other any facilities for knowing how much of it each gets. One may keep its own records carefully, ascertain exactly how much it received for its share of the competitive traffic, how much it cost it to get it (barring losses by "cut rates" which are an incident to competition), and approximately its net profits (or losses) on this business. But it does not know much its neighbors got nor how much they made on it; and even though the results of its business were unsatisfactory, the possibility remains that the business is large, capable of yielding considerable profits, and actually yielding such profits to some of the lines competing for it. The business may grow, rates may be maintained hereafter, and the line which lost on it last year is not willing to give up its chances of a profit hereafter. Hence it continues to spend

money to secure a share of the business and to reduce the rates on it by competing for it; as of course do those other lines which do not even know how much of the business they got, the cost of getting it, or the net result to their treasury. This is especially the case where the business is actually large and very much divided or sub-divided. Take the traffic out of New York for instance. The total amount shipped from New York is truly enormous, and a very large proportion of it is valuable merchandise, which can afford to pay a high rate for transportation. There was a time when much of it did pay a high rate, affording a good profit to the carrier. Moreover, cars come to New York filled with produce from nearly all the standard-gauge roads in the country. The lines over which these cars run are of course anxious to have them filled, as far as possible, with this valuable freight. One whose eastern terminus is a thousand miles west of New York forms a link 200 miles long in a route to some Western town which has two or three other eastern connections. Now the Western company seems to argue that because there is a great business out of New York, therefore it is possible for it to get a considerable business there to carry to its Western terminus, and as the Eastern trunk line is indifferent as to which route the traffic takes beyond its own line, the Western road establishes an agency in New York in order to secure a share of the great New York business.

Now the fact is that this great business—that part of it which goes to the West—is from the start divided among four different roads; when it has gone about 450 miles on the trunk lines it is further subdivided several times for each trunk line, and thence westward the divisions are almost innumerable, and the total of that going to the Western terminus of the Western road may be absolutely small, while two, three or four lines stand ready to take it, to pay for securing it, and even to fight for it. All, perhaps, establish New York offices, and so an army of agents is there constantly bidding for traffic and, sooner or later, reducing the average rates, frequently through contests costing millions in the aggregate to all the companies involved, while in more than one case the profits on the traffic obtained are less than the expense of the agency. Indeed, the gross amount of business in some cases must be ludicrously small.

Now any combination for a division of business, or of the earnings or profits from a business, must keep a record of it, which record can be made to include the destination as well as the origin of each shipment, and the particular route by which it was consigned, the freight charges on it and the share of every railroad which carries it part of the way. In the case of New York, for instance, at the end of a given period, under the working of the present combination, it will be known how much freight of each class went to Chicago, how much to St. Louis, how much to Peoria, etc., and how much was billed to Peoria via Chicago, how much by the Toledo, Peoria & Warsaw, how much by the Lafayette, Bloomington & Mississippi, how much by the Indianapolis, Bloomington & Western, etc. If it appears that the total earnings of the business to a town reached by three connections of some of the trunk lines are but \$100,000, the manager of one of these connections is not likely to put forth any great effort or spend a large sum of money to secure the profits on the largest share of this business which he could hope to get. He will be still less likely to involve his road in a railroad war on account of it, and if one of the lines should "cut rates" on this business, the others and the trunk lines with which they connect would hardly plunge into a conflict involving nearly all through business. They would conclude that the game was not worth the candle. But so long as it is or may be supposed that there is an enormous traffic and a possibility of large profits, so long will great efforts be made to secure it and great risks run to prevent its diversion.

As an example of the disproportion between the expenditures made to secure a traffic and the value of the traffic, we may cite the case of a new railroad intended to shorten the route between the Northeast and a Southern city. This road cost several millions of dollars; among its projectors were some of the most experienced and in some respects the ablest railroad men in the country; one of the chief objects aimed at in constructing the road was to secure the through passenger traffic between New York and other Northern cities and a Southern city, and much stress was laid on the importance of this. Meanwhile a railroad officer familiar with the field and with facilities for obtaining information took the trouble to ascertain the average number of through passengers between this Southern city and the Eastern States. He found it to be seven each way daily! and for these several routes competed, so that the new one could not hope to get them all. Of course it is not possible to ascertain exactly the amount of traffic which a new railroad will obtain, especially if the new road is in a new country, yet to be settled and cultivated; but in the case of the traffic actually obtained by competing roads from certain towns or districts, no such obstacle stands in the way. The competing roads may know if they will agree to, and

there are not many cases in which knowledge can prevent greater waste or folly. It is hardly possible that some of the great evils in competitive business will be permitted to continue, if once certain facts of that business become fully known to all the carriers who compete for it.

MR. WELLS' REPORT ON BOILER MATERIAL.

Probably many of our readers who are interested in the subject discussed in the "Report of the Committee on the Best Material, Form and Proportions for Locomotive Boilers and Fire-boxes" have been deterred from reading it by its great length and the fact that its publication has now extended through three numbers of the *Railroad Gazette*. Those to whom information concerning the qualities and endurance of boiler material would be of value, and who have failed to read the report referred to, for the reason suggested, have, it is thought, made a mistake, and would do well to read it thoroughly from beginning to end. There are, however, some who are not directly concerned in the construction or repair of locomotives to whom a summary of the report, with perhaps some comment thereon, might be more useful than the report in *extenso*.

Although it was nominally submitted by a committee, it was known to be chiefly the work of Mr. Wells, who expended a great deal of work and thought on its preparation.

With reference to the use of steel for boiler shells, the report contains two important facts, one that not a single instance is reported of steel being ruptured in the shell of a boiler from changes of temperature, rupture from that cause being of frequent occurrence with fire-box plates; the other fact is that those who have had much experience believe that steel is less liable to injury from corrosion than iron. The cracking of fire-box plates due to changes of temperature is still of frequent occurrence. Of those reported to the committee 86 per cent. were side plates, 7 per cent. back end plates, 4½ per cent. tube plates and 2½ crown plates. It is therefore the side plates that cause the chief difficulty. This, taken in connection with the fact that "the crack is invariably vertical," brings the investigation of its cause down to much narrower limits than before these data were obtained. It has been the opinion that the rupture of such plates was due solely to inherent defects in the steel. To this Mr. Wells very pertinently says: "It is not reasonable to suppose that all or nearly all the defects in steel sheets are to be found in those used for the side sheets of the fire-box, and always at a point not far from the top of the fire, and that they are of such peculiarity as to cause the crack to take a vertical direction instead of horizontal." What, then, is the cause of the cracking of the fire-box plates? It is to the answer of this question that Mr. Wells devoted his attention.

In a report made at the convention the previous year, Mr. Wells advanced the theory that the cracking of the side sheets was due to their unequal expansion and contraction, owing to the difference in temperature at or near the surface of the fire, and at the top and bottom of the fire-box, which eventually produced a condition of internal strain in the side sheets. In order to show that such an effect did take place he constructed what might be called a model of the side of a fire-box, the side plate of which consisted of a number of narrow horizontal plates 3½ in. wide. By attaching a delicate measuring apparatus to these he was enabled to determine the exact amount of expansion of each one of them when exposed to the action of the fire. This apparatus showed clearly that the maximum expansion took place just above the fire, and the least below the top of the grate. From the top of the fire the amount of expansion diminished gradually towards the top of the fire-box.

Mr. Wells' theory is, that the portion of the side sheets exposed to the most intense heat becomes permanently compressed, owing to its expansion when heated, and that on cooling it is then subjected to great tensile strain, because it contracts more than the surrounding parts of the plate. Whether this theory accounts for all the facts it is difficult with our present knowledge to say. Mr. Boon, of the Pittsburgh, Fort Wayne & Chicago Railway, says in substance that a theory, to be sound, should hold good in all cases, and therefore if the cracking of fire-boxes is due to their expansion, then all fire-boxes should rupture for the same reason, whereas in his experience he finds that in engines built exactly alike plates in one of them will crack and in the other one will not, or a plate on one side of a fire-box will fail and the other last for a long time. To this Mr. Wells says that of several hundred sheets which were cracked and reported to the committee, but one crown-sheet was included, showing that when, as in the case of a crown-sheet, a plate is the same distance from the fire and subjected to nearly the same temperature at the same time, cracking does not occur. But it is also said that the quality of the sheet has much to do with its durability and its resistance to the forces tending to destroy it. The same causes which rupture a plate of poor steel are at work to destroy one made of a good quality of material, the difference being, that the good

quality will accommodate itself to those strains by its elasticity or ductility.

There is thus a virtual agreement between those who contend that the cracking of fire-box plates is due to their expansion and contraction and those who attribute it to the quality of the material of which they are made. In the report it is said that if a poor quality of material was not subjected to the strains caused by expansion and contraction, it would not break; but, on the other hand, if the quality is good, it would resist such strains. In order to make assurance doubly sure, it would seem that the thing to be aimed at is, to make the plates of the best material and then protect them from strains caused by expansion and contraction. If the cracking of fire-box plates were attributable solely to their expansion and contraction, then iron and copper plates would be liable to failure from the same cause, whereas such failure is comparatively rare. The inference, then, must be that, owing to the difference in the quality of iron and copper plates, they are capable of resisting these strains, whereas steel, or some qualities of steel, are not. Undoubtedly the steel plates made now are of more uniform quality and better suited for fire-box plates than those made a few years ago; at the same time there still remains a possibility that steel may change its quality by use. Steel is undoubtedly more liable to change its quality by change of temperature than either iron or copper. It is said that a certain amount of carbon is necessary to produce steel which can be tempered, and that fire-box steel is now made with so little carbon that it is not capable of tempering. While this may be so, it is possible that steel may absorb carbon when exposed to temperatures as high as those to which it is subjected in locomotive fire-boxes.

It does not seem certain that the plans proposed for corrugating the side plates of fire-boxes will be a sure remedy of the evil, as there are reports of the cracking of some such corrugated plates. If the reports received by the committee fairly represent the facts of the case, it indicates that the corrugation of crown-sheets is not necessary, and if it is true that the cracks in the side plates are always vertical, then it indicates that the corrugations need only be made in the same direction, as the direction of the strain is at right angles to the cracks.

Although the report of this committee may not have proposed any specific cure for the evil of cracked fire-boxes, yet the researches of Mr. Wells have indicated the cause of the evil, and what he has done will doubtless be of great assistance in enabling us to find the source of the difficulty, and in providing a remedy.

The portion of the report which discusses stay-bolts has made the cause of the breaking of such bolts clear, and also indicates which ones may be expected to break oftener. The proposal that the upper rows of stay-bolts, if not the rest, should be made hollow or tubular is a good suggestion. If some of the manufacturers of steel would produce a hollow stay-bolt, it seems probable that there would be, as there certainly should be, a good demand for it.

With reference to the form of the boiler, the testimony received by the committee was almost unanimous in favor of "wagon-top" boilers. Yet, quite curiously, several of the ablest members of the Association give in their testimony very decidedly in favor of straight-top boilers and against the wagon-tops.

On the form and proportion of the fire-boxes, the committee recommend no change excepting to suggest an increase in the number or length of tubes. With the present form of construction of locomotives, any material change in the boiler is impossible, but the question is now being considered by many persons whether some very material changes in the plan of constructing engines are not desirable, in order to get a larger boiler, and especially a larger fire-box. When locomotives did not exceed from twenty to twenty-eight tons in weight, the available width between the frames was quite sufficient for the fire-box, but with the rapid increase in size of engines from thirty up to thirty-six and thirty-eight tons weight, the case is quite different. Attention has heretofore been called in these pages to the fact that master mechanics in this country seem to be too prone to regard locomotives from one point alone—that is, facility of being repaired. The object for which a locomotive exists is to haul cars, and the engine which will do that for the least expense is the most profitable, no matter whether it costs much or little for repairs. It should be kept in mind that although an engine may cost very little for repairs, it may do so little work that the cost of train service and other expenses may exceed very much any fancied economy of repairs. If master mechanics were accustomed to estimate the efficiency of their engines more by the cost per car per mile, and not so much by the cost per mile run, we are inclined to believe that they would see wherein their engines are less economical than they think they are.

The latter part of this report is devoted to combustion, a reference to which will be deferred until the publication of another paper, which reports the results of a series of experiments relating to this same subject.

The New East-Bound Tariff.

The new Chicago-New York rates, which are the basis of the rates from other Northwestern points to the seaboard cities, show a very large decrease in the rates on hog and cattle products, varying from 10 to 15 cents per 100 lbs., but only five cents on fourth-class freight, and none at all on grain in bulk. The reduction, however, is more in form than reality, for so large a part of the traffic down to July 1 was carried on contracts made more than a year ago, and usually at 20 cents per 100 lbs., or even less, that the "regular rates," though apparently very firmly maintained for such new business as offered, probably were received only for small fraction of the great staples which are chiefly handled by large establishments, such as provisions. The rates made on these staples, which usually the railroads have had pretty much to themselves (though a great deal was always carried by the lake-and-rail lines—propeller to Erie or Buffalo and rail thence to the sea) are very low—from 30 to 35 cents per 100 lbs., and are probably intended to put an end to canal shipments, which have not been very large, so far, but successful enough, apparently, to make it probable that a considerable part of the barrelled pork, beef and lard would prefer this route at 7 or 8 cents per 100 lbs. to the all-rail rate at 45 cents. With the all-rail rate at 30, as it is by the tariff of July 2, the difference between it and lake-and-canal route is less than ever before, and it is not likely that canal competition will be felt in these articles hereafter.

While the reduction in the tariffs on provisions, very little of which has been diverted to the water route, has been large, the tariff on grain, which is mostly taken by water, remains unchanged at 30 cents per 100 lbs. It is probably thought that the grain traffic is not worth having at a lower rate, or at least not at the rate which it would be necessary to make to take it from the water route. By lake and canal grain is now taken for about 12½ cents per hundred, in spite of a slight advance in rates recently. A reduction in the rail rate from 30 to 25, or even 20, would not be sufficient to meet this water rate, which, moreover, would be sure to fall still lower if the railroads were to take a considerable portion of the grain traffic which the vessels now get. So long as there is so little grain to carry, and so many vessels with nothing else to do eager to carry it, the railroads cannot expect to obtain such of it as goes through for export if they charge a paying rate. They must carry it at a loss or not carry it at all; and they seem wisely to have concluded that they will not go into debt for the privilege of carrying grain. What they can endeavor to do is to continue the carriage of grain consigned to interior points in the East for consumption, and for this they can probably continue to collect a rate which will pay some profit, or at least not result in loss, except to places on or near to the canal. This business the railroads have had for many years, and they can keep it even when the water rate is much the lowest, because of the saving in transfers, etc., which are required by the water but not by the all-rail route.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Philadelphia & Atlantic City.—Completed from Camden, N.J., southeast to Atlantic City, 54 miles. It is of 3 ft. 6 in. gauge.

East Line & Red River.—Extended from Hickory Hill, Tex., northwest to Daingerfield, 10 miles.

Maple River.—The first track is laid, from the Chicago & Northwestern, near Carroll, Ia., northwest 7 miles.

This is a total of 71 miles of new railroad, making 689 miles completed in the United States in 1877, against 740 miles reported for the corresponding period in 1876, 426 in 1875, 690 in 1874, and 1,518 in 1873.

THE PETROLEUM TRAFFIC continues to be extraordinary, and also continues to be diverted from the Pennsylvania Railroad, the New York roads getting the bulk of it and the Baltimore & Ohio something like its last year's business. The New York roads never before had anything like so great a traffic in this staple, as is indicated by the fact that New York alone has during the first half of this year exported more than all the ports put together exported for the corresponding half of last year. New York exports have nearly doubled, while Philadelphia exports have fallen off 30 per cent, and Baltimore exports 17½ per cent. Of the Philadelphia receipts, most is said to arrive now by the Erie. This great change is due to a quarrel between the Pennsylvania Railroad and the Standard Oil Company, which is now so great a power in the oil business as to be considered substantially to be the oil business. The quarrel has some connection with the establishment of refineries at Philadelphia under the auspices of the Empire Line, which is the oil carrier over the Pennsylvania Railroad. The Empire Line has carried largely to Baltimore and New York as well as to Philadelphia, and has, or had, a great system of pipe lines in the oil regions, by which it seemed to have secured itself a very large amount of this traffic, but it seems not to be getting it now. The total traffic has been great without example this year, but one result, or accompaniment, of the diversion of traffic has been a considerable reduction in the rates, which until this year have been pretty steadily maintained at a satisfactory figure. Last year when nearly all other through traffic except live stock was carried at less than cost, petroleum rates

were steadily maintained. The price of the product has fallen so of late (about one half since the beginning of the year) that the producers feel the need of low rates to leave them any margin of profit. The prices, however, are by no means the lowest known to the trade, so that the great increase in consumption cannot be ascribed to unexampled cheapness. The average prices of the half-year were probably fully as high as the average prices of some years past. The market for the material seems to be growing. It is already used more or less in all civilized countries, and if, as seems probable, American petroleum is to supply illumination to the world, there is not much danger of a permanent over-supply.

THE LAKE SHORE REPORT for the first half of the year does not compare favorably with last year's operations, the receipts being 8 per cent. less and the expenses 2½ per cent. greater, resulting in a reduction of 28½ per cent. in the net earnings of the half-year. These latter, indeed, are but \$1,725,000, which is \$354,000 more than the fixed charges of the half-year—interest on bonds, rentals of leased lines, and the 5 per cent. dividend on the small amount of guaranteed stock. Whether any part of the expenses on account of the Ashtabula disaster are included with expenses, we are not told; but the statement is made that the company "has no floating debt, nor any outstanding obligations of that nature," so that the heavy payments on that account must have been made from income. The total surplus is equivalent to about 0.71 per cent. on the stock, and of course no dividend is made for the half-year. The comparison is made with a period which was partly exceptionally favorable and partly very unfavorable. The first three and a half months of 1876 traffic was good and rates were generally remunerative, and moreover, the winter was particularly favorable. During the first half of this year, traffic has been lighter, though not very much lighter, except in grain since navigation opened, but though rates have been nominally well maintained, a very large proportion of the through freight—probably most of it—has been carried on contracts made last year at last year's ruinous rates. These contracts all expired, it is said, with the half-year, so that it is altogether reasonable to expect larger returns from the second than from the first half of the year, on the trunk lines, even if there is no improvement in the amount of the traffic, which latter depends largely on the coming harvests. The wretched contracts made last year have gone far toward ruining more than one railroad company, and it is to be hoped that the practice may serve hereafter as a frightful example, to be carefully avoided.

DAILY FOREIGN CAR REPORTS are requested so urgently in the circulars which we publish this week, one from three Cleveland land superintendents and one from the President of the Louisville & Nashville, that we may expect in time to find the practice of making them general. The gentlemen, who desire the information for the benefit of their own roads, do not rest with a simple request for it, but present a plan for obtaining and recording it, a plan which has been for some time in use on several roads, and which therefore cannot be said to be "impracticable." What is required is, that each company may be informed daily as to what each of its cars has done and where it is on every day that it is away from the home line. The plan proposed by Messrs. Flint, Cooper, Paine and Standford is substantially that submitted to the Car Accountants' Convention in Cleveland last October by Mr. A. W. Davies, Car Accountant of the Atlantic & Great Western, and described in the *Railroad Gazette* of Nov. 24 (page 510).

LOW CANAL TOLLS are credited with having secured to the canal and diverted from the railroads a very large amount of grain this season, and to prove this a comparison is made with last year, showing an enormous falling off in the receipts by rail since navigation opened, and a comparatively small one in the canal receipts. It is assumed that this result has the reduction of tolls, amounting to one cent per bushel, for its cause. The fact is neglected that last year the railroads charged 5½ cents per bushel less than they do this year, and certainly this increase in the rail rate ought to have greater effect in diverting business than a decrease in the canal rate not one-fifth as great. In all probability, if the canal rate was increased a cent a bushel, whether the increase went to the State as toll or to the boatman as profit, it would not make any appreciable difference in the shipments: the difference in favor of the water route would still be so great that the railroads could get little or no grain which could reach its destination by canal.

WATER RATES have improved a little. Corn from Chicago to Buffalo, which was at one time as low as 1½ cents per bushel, and most of the season has been 1¾, for a few days has been quoted at 2 cents; the canal rate from Buffalo to New York is 4½ cents, while it touched 4 cents at one time, and much of the time was as low as 4½. Ocean rates have not changed much and continue very low, though they have been lower. Quotations for Tuesday last were 4½ to 5d. per bushel for grain by steam from New York to Liverpool, and 4s. 6d. per quarter by sail to Cork for orders. The traffic is very light by lake and canal, but there is a large petroleum movement by sea.

THE PENNSYLVANIA RAILROAD COMPANY makes a very good showing in its report of earnings and expenses for the five months ending with May, just made public. Earnings (of all lines east of Pittsburgh) were smaller by 10½ per cent. this year, but the reduction of expenses is so great as to leave an increase in net earnings of 8½ per cent. These months last year were quite favorable to this road, though they included centennial passenger traffic only for a few weeks. The result on the lines west of Pittsburgh is said to show a decrease of \$150,000 this year, leaving for the whole system an increase of \$165,000 for the five months. This company cannot be expected to do as well as it did last year for the remainder of the year, as then it had an enormous passenger traffic.

VARIOUS INFORMATION IS WANTED by a subscriber who writes as follows: "What is the average price of locomotives per horse power and per ton weight, also passenger, box and flat cars? What is the ratio of increase of price as per increase of power? How much more price per horse power do railroad locomotives cost than stationary engines? How much coal per horse power per hour do they use?" As some of these conundrums are unanswerable, and the others would require anywhere from a day's to a week's hard work to investigate before a satisfactory reply would be possible, we submit them to our readers, or any one else with time for their consideration, which we have not.

THE HISTORY OF TUNNELING, which Mr. Henry S. Drinker is preparing (and which is to be published next fall) at this date includes accounts of 1,624 tunnels, 282 of which are United States railroad tunnels, eight United States canal tunnels, while several in this country, like the Sutro, are for mining and miscellaneous purposes, and about 1,300 are in foreign countries. Mr. Drinker has made great exertions to collect full information of all tunnels, and his book will probably be nearly exhaustive of the subject.

A WESTERN POOL OF EAST-BOUND FREIGHT is proposed, to be substantially on the same basis as the New York pool of the four trunk lines. It may not be so necessary to have a combination of these roads to maintain rates, especially with an effective trunk-line pool, but there would be a grand opportunity to reduce expenses in such an arrangement. A meeting is held in Chicago this week to consider the subject.

NEW PUBLICATIONS.

Long Island, and Where to Go, is the title of a very neat and attractive guide book to Long Island, or rather to the parts of it reached by railroad, issued by the Long Island Railroad Company, which now works all the railroads on the island except three or four short excursion routes used solely for passengers. It is really quite an extensive book, having about 250 pages, a map of the island on a scale of six miles to an inch, and the official time table for all parts of the road on a large folding sheet. Every place reached by the road is described at some length, and the book is profusely illustrated with engravings, relevant and irrelevant, many of them being of actual buildings or scenes on the island. Long Island can almost be said to be one vast summer resort, and is also much frequented by sportsmen, so that the excursion travel forms a large part of the business of its railroads, and this is sure to be promoted by the circulation of a book of this kind, which in the first place gives those who have made up their minds to go somewhere the information they need as to the character of places and the means of getting there, and in the second place is likely to kindle a desire to go in those who had not meant to.

Practical Treatise on Lightning Protection.—Mr. Henry W. Spang, Assistant Superintendent of the Philadelphia, Pottsville & Reading Railroad Company, has written, and Claxton, Remsen & Haffelfinger, of Philadelphia, have published a treatise on a subject of importance concerning which more quackery is practiced, probably, than in any other matter. Certainly if this book will disseminate correct notions concerning lightning protection, or dissipate the grossly erroneous ones which are taught so energetically by the armies of peripatetic "lightning-rod men," it will do a much needed work.

Railroad men will be especially interested in some paragraphs from Mr. Spang's book which we copy elsewhere.

General Office Accounts.

[From a forthcoming work entitled "Railway Revenue and its Collection," soon to be published.]

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[Continued from page 303.]

THE JOURNALS REQUIRED.

The information the ledger contains is posted from the journal and cash book.

In the preceding chapter it is shown that economy and an expeditious discharge of the business in hand are best secured by a judicious multiplication of the number of ledgers. The same may be said to be equally true in reference to the ledger journals.

Compared with the ledger, the journal is an abstract of the transactions recorded.

This abstract record is a partial verification of the authenticity of the ledger account.

The journal is indispensable in this, that it affords concise and connected information in reference to all the details that enter into each entry that appears upon the ledger.

It follows then that where the accounts are numerous and complicated, as they always are with railway companies, an immense amount of detail must be methodically spread upon the journal.

Upon roads doing comparatively little business, the details that must find a permanent record upon the general books require that more than one journal should be used.

Work is facilitated and economy best secured by such a system.

The side journals or blotters are written up in the different branches of the department of accounts.

Instead of filing with the General Book-keeper, each month, manuscript statements of the details of the traffic or expense accounts, the particulars are entered in a journal especially arranged for the purpose and giving the information in the most compact form consistent with a proper elucidation of the different accounts.

A manuscript statement filed with the General Book-keeper would, for obvious reasons, require to be entered in detail upon the general journal, necessitating the repetition of an immense amount of clerical labor.

The information coming to him in a shape susceptible of easy reference and careful preservation, he transcribes merely the totals of the sub-journals upon his general journal.

The side journals thus become a well-understood part of the paraphernalia of the general books.

The voluminous details that constitute the basis for the matter spread upon the side journals are retained in the different divisions of the accounting department.

RELATION OF THE GENERAL JOURNAL TO THE SUBORDINATE JOURNALS.

The general journal^{*} occupies the same relation to the other journals that the general ledger does to the side ledgers.

As already noticed, only the aggregate footings of the subsidiary journals are entered upon the general journal.

To illustrate this, we will take the entry required to be made each month on account of the receipts and payments of station agents for the freight traffic of their several agencies. Upon the receipt of the "Station Agents' Freight Journal," duly authenticated, as all journals are, by the officer in charge, the details are summarized as follows on the general journal:

"Station Agents and Conductors..... \$767,910.80

To Freight Earnings..... \$767,910.80

"For this amount is per station agents' freight journal A. A. folio 78, written up and certified by Richard Roe, Freight Auditor, and on file with the general books of the company."

The accounts named are general ledger accounts and the amounts are duly posted under the proper headings upon that book.

The side journal shows the balance due to or from each agent, and each balance is posted in the side ledger to the debit or credit of the agent it concerns. Of course, all the balances so posted in detail agree exactly with the general amount charged to agents on the general ledger as already shown.

It is not absolutely necessary that the information the blotters contain should be summarized upon the general journal. The data could be posted directly to the general ledger. The labor, however, is trifling, and it simplifies matters to have all the accounts that appear upon the general ledger follow some direct and well-understood channel.

NECESSITY OF CLEARNESS.

With the exception of the summary of the side journals, everything entered upon the general journal should be posted in such detail, and with such careful and conspicuous clearness, that a person possessing only a general knowledge of railway affairs and unskilled in the technicalities of book-keeping could understand each entry and the reason or basis for making it.

An examination of ledger journals will elicit the fact, that in many cases they contain little more information than the names of the various accounts and the amounts.

No gleam of light, no friendly star animates the impenetrable gloom that envelops them.

The natural habits of those immediately in charge of such books are evidently of a nocturnal order.

Accustomed to their route and field of operations, their instinct guides and controls them.

Light with them becomes a superfluity, and thus it is that, in time, their books become marvels of brevity, crowded with hieroglyphics and signs, pregnant with meaning to them, but incomprehensible to everybody else.

THE GENERAL BOOK-KEEPER.

The position of the General Book-keeper of a railway company is one requiring the incumbent to be a man of ability; he must possess unusual clearness of perception and statement; he must be able to answer satisfactorily the abstruse questions that come up before him from day to day in arranging and adjusting the general accounts of the company; he must be discreet in his utterances; he must be able to comprehend quickly the intent and meaning of contracts, leases, understandings and agreements of the most elaborate nature; he must be able to analyze at a glance the innumerable statements, both petty and great, upon which his work is based; as a clerk he must be absolutely accurate; his training and habits of mind must be such that he will instinctively question every statement which he is called upon to transcribe until, from investigation, its correctness becomes apparent to him; he must be able to direct intelligently the work of the subordinates of the office, and to perform this duty properly he must be experienced, decisive and prompt; he must be energetic, keeping the work of the office well in hand and never permitting it to lag.

The General Book-keeper is a part of the staff of the accounting officer, and as such should comprehend, generally, the object and necessity of the checks and balances that should honeycomb the organization of a railway.

THE JOURNAL VOUCHERS—THE NECESSITY OF CAREFULLY PRESERVING THEM.

For each and every entry made upon the journals, a voucher is required.

This voucher is the evidence that the entry is right and proper.

The journal entry is only the essence of the vouchers.

It is, besides, merely a copy.

Only such matter is spread upon the journal as is necessary to a clear understanding of each affair.

The authenticated facts that prove the correctness of the transaction upon the journal and its authoritative character appear upon the face of the voucher or are attached to it.

The preservation of this voucher is therefore a matter of great importance.

In reference to the peculiarities of these vouchers, a great diversity exists.

The vouchers that form the basis for the entries on the general journal are numerous and varied. All sorts of statements receive respectful attention, and histories of the most varied character find record upon the journal referred to.

It is a clearing house in which differences are harmonized and the most delicate affairs adjusted.

A petty difference of a few shillings between agents is set right with all the circumstantiality of detail that characterizes the declaration of millions.

In just such minuteness and method as this, carried out with

* Form 76, Appendix.

merciless exactitude, rests the protection and permanent security of corporations.

The vouchers that make up the general ledger file consist of original statements, approved bills, certified accounts, transcripts of contracts, summaries of leases, transfers or adjustments of differences, rectification of errors and others of which no general classification can be made.

All journal vouchers should be numbered consecutively as they are entered, commencing with number one; each month they should be labeled and filed away by months in the order in which entered.

In a certain sense, the auxiliary journals are merely vouchers belonging to the general journal.

Each auxiliary journal in turn also has its train of attendant followers, but of a more obscure and humble origin.

The vouchers that form the basis for entries on the side journals consist of detailed statements, reports, abstracts and accounts received from agents, conductors, storekeepers and other subordinates and officials who have any voice or standing in the conduct of the business of the road.

All of these vouchers are original matter and should be carefully filed away, so that each and every entry on the side journals can be verified by reference to the original returns whenever the accounting officer may think proper.

Whenever the number and extent of the returns received from agents and others warrant it, such returns should be bound with cheap but durable material each month; when the number of reports will not warrant this, then they should be arranged in volumes and bound quarterly or as often as necessary; in other cases they should be carefully labeled and filed away in a secure place.

The returns and papers that cannot be bound should be carefully and systematically filed, so that they may be perfectly secure from fire or theft, and easy of access.

Reports of Foreign Car Mileage.

The superintendents of the Cleveland, Columbus, Cincinnati & Indianapolis, the Atlantic & Great Western and the Lake Shore & Michigan Southern roads have united in the following circular:

SIR: Your attention is hereby very earnestly invited to the advantages of a plan for reporting the individual mileage of each freight car while absent from its own road, which has been published in several of the railroad journals, and which we believe is a very desirable modification of the present method of car recording. We are able to speak confidently of its practicability from a trial of some months; as to its value, we presume there will be no doubt among experienced railway men.

If a general concurrence in the plan proposed can be secured, there will be no longer any need for the multitudinous car tracers now going about, nor will it be necessary to employ men to hunt up lost rolling stock, since the daily reports from foreign roads will give its history, and the knowledge of how much service is performed by each car will be useful to its owners on many accounts.

As all this information may be gained with only a trifling outlay at first, resulting in a positive saving of expense if once fairly under way, we beg you to instruct your car recorder to examine the system carefully, and to report to you his views as to its practicability.

We will cheerfully furnish any exchanging companies with daily reports of their cars upon our lines.

It may perhaps be well to remark that if, on trial, an experiment with the proposed system does not prove satisfactory, nothing will prevent an immediate return to the system at present in use; the only difference in the two being that by the proposed plan the *owners* of cars will know where they are and how much they are used, as well as the *users*. In order to secure uniformity in the system and to avoid confusion in the designating letters taken by each road, as well as to have the necessary tables of distances, branches, etc., prepared systematically, we suggest that the car recorders of the lines already exchanging *reports of the individual mileage* of foreign cars be a committee to assign the designating letters to new companies, which may adopt this system, to serve until the number of roads united upon it shall be fifteen, when meeting of the car recorders should be held, a simple organization adopted, and officers for the performance of these duties should be chosen.

Regular meetings of the members of such an organization could then be held for the improvement of the system and of the blanks in use, and result in the advantage of all the companies interested in the interchange of mileage reports.

If you desire further information concerning the proposed plan, please to communicate with either of the undersigned; and also please to signify to one of them if you will make the trial of it, hereby requested; an explanation of the principal features of the system is herewith offered.

THE PLAN.

Explanation of a proposed plan for the interchange of reports of the individual mileage of foreign cars:

To establish this system, uniformity in the reports and in the time of rendering the same is very essential, and the following are other requirements:

FIRST. That each road be designated by a letter or letters assigned to it; this letter or letters to appear on all car reports issued by it.

SECOND. In order that the mileage of each car may be speedily and economically ascertained, it is necessary that all reporting roads shall number their stations (for freight car movements) according to the miles from their eastern or northern termini; branches to have the letters A, B, C, etc., prefixed to their distance from their junction with main line, in the order in which they diverge, as illustrated.

THIRD. That the form of interchange blank be a standard form, which shows points of departure, number of car, points of arrival and miles run (see specimen below).

FOURTH. That all roads shall furnish details of their road,

FORM OF DAILY INTERCHANGE REPORT.

| D | | | | D | | | |
|-----------------------------|-------------|---------|--------|--------------------------|-------------|---------|--------|
| N. Y. C. & H. R. B. 5/8/77. | | | | Michigan Central 5/8/77. | | | |
| From | No. of Car. | Left at | Miles. | From | No. of Car. | Left at | Miles. |
| For'd | | | 50,403 | For'd | | | 403 |
| 0 1948 | 88 | 128 | 128 | | | | |
| | | | 86 | | | | 26 |
| A 0 1948 | A 86 | | | 183 | 590 | 209 | |
| 0 2740 | 183 | | | 183 | 88 | 1704 | 183 |
| | | | | Total. | 50,800 | Total. | 524 |

showing names of stations, numbers of same (which is numbers of miles from commencement of road), junction, stations

and name of road, classification of equipment, names of officers and location of offices, and such other information as desired, the same to eventually be compiled in the form of a book of charts, for the information of all such roads as adopt this plan.

EXPLANATION OF REPORT.

"D" shows this report to have been issued by the L. S. & M. S. R. R. (that being its designated letter), 5/8 being the month and day, viz., May 8, 1877; movements of car 1948 N. Y. C. on L. S. & M. S. R. R. is shown in above blank. Station "0" indicates Buffalo (point of departure); "88" Erie, "128" Ashtabula, being points of arrival; this car, having been moved by two trains same day, the figures set in miles column show this car to have moved 128 miles, it being simply the difference between 0 and 128, thereby dispensing with all distance tables in freight car movements, and at the same time being easily understood by all.

It will be observed that this method of numbering stations admits of the introduction of intermediate stations without the least disorder or inconvenience. The next movement of this car appears from A to A 86, Ashtabula to Oil City being 86 miles from Ashtabula, on the Franklin branch, designated as the "A" branch, the letter A being used to show the branch, and of no mileage value. This, in connection with its previous record, gives the N. Y. C. R. R. a continuous record of the movement of its car, also gives that company its latest location, with date, filling up the spaces in its record book with movements which are now blank. The total mileage is posted daily on each report and carried forward to next day's blank, thus the last reports of the month give the aggregate miles made by cars on each road, thereby saving an expensive mileage ledger and the labor of posting the daily footings and the final monthly footing; also, showing daily the number of miles due from connections, and by the 5th of the month each car recorder may ascertain the mileage due his road.

This does not change the present form used by you for recording movements of your own cars, but avoids the need of recording foreign cars, unless you prefer to record them, as the impression copies of the reports sent to the owners of them contain all the information required, in order to answer inquiries as to foreign cars, for tracers will, of course, be sent to the last roads reporting the cars, even though a number of roads intervene, thereby saving labor and avoiding the present delay in putting an absent car in motion.

THE LOUISVILLE & NASHVILLE CIRCULAR.

Mr. E. D. Standiford, President of the Louisville & Nashville Railroad Company, has also sent out this plan of reporting to Southern roads with the following circular:

DEAR SIR: The present method of keeping and reporting car mileage is unsatisfactory, cumbersome, and decidedly "behind the age." With the present system it is impossible to arrive at the mileage of a freight car wheel; and "lost cars" are found only after a slow "tracer" system, assisted by the employment of "lost car agent," etc. This old system should be abandoned, inasmuch as the late system of "Daily Reports of Foreign Cars" fully answers the wants heretofore seriously felt; and through its perfect simplicity not only enables each road to know the mileage of its cars while on foreign roads, but places a knowledge of the whereabouts of each individual car in the hands of managers of railroads daily.

As the executive and General Manager of this road (which, from one of its termini being on the Ohio River, may be said to be the initial road of the South and Southwest), I call upon the general managers of all the roads in the South to assist me in the inauguration of this system. Certainly it is right, just and should be considered necessary, to report individual mileage; and a system that will insure the knowledge of daily situation of all the cars of a company is almost equally to be desired. This company has felt the want of knowledge of its "individual freight car mileage" for years, and has now fully concluded to demand, as a right, "individual car mileage" reports from all roads after a certain time—not fully decided upon at this writing. But considering the beauties of the new system, its effectual checks and perfect simplicity, I wish to call your attention to it, and to ask if I may count upon your assistance in bringing the system into general use. The objective points of improvement and distinctive features of the system are probably known to the officer at the head of your accounting department; but if not, the accompanying sheets will fully explain. This system is now obtaining in the North, and a circular asking general co-operation is now being circulated, signed by the general managers of the Lake Shore & Michigan Southern, the Cleveland, Columbus, Cincinnati & Indianapolis, and the Atlantic & Great Western roads. Indeed, the inclosed explanations are but a transcript of those prepared by and accompanying a circular of these last-named gentlemen.

Any further information beyond what accompanies this letter may be obtained from car accountants of before-mentioned roads; N. Monksarrat, General Freight Agent, Paducah & Memphis Railroad; Gen. R. H. G. Minty, General Manager, Paducah & Elizabethtown Railroad, and H. T. Curd, Auditor of this company.

Please respond as early as may be convenient, and if favorably disposed, and a sufficient number of roads join with us, a convention should probably be called at an early day. A suggestion from you as to time and place would be timely and thankfully received.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Atlantic, Tennessee & Ohio.—At the annual meeting in Statesville, N. C., July 5, the old board was re-elected and subsequently met and elected W. R. Myers, President; J. J. Gormley, Superintendent and Treasurer.

Brazos & Colorado.—The officers of this new company are: President, A. J. Russell; Vice-President and Manager, L. E. Post; Secretary, J. H. Woodruff. The office is at Columbia, Texas.

Bullion Bell.—This company has been organized by the election of the following directors: J. E. Dean, M. Dilworth, M. Hulings, W. J. Hulings, D. F. Nesbitt, S. Simcox, Roy Stone. The board elected M. Hulings, President; S. Simcox, Vice-President; W. J. Hulings, Secretary and Treasurer.

Boston & New York Air Line.—The position of Superintendent has been offered to Mr. A. Y. Beach, now Agent for the Boston & Albany at Springfield, Mass., but he has not yet accepted.

Canada Southern.—Mr. James Tillinghast has been chosen President, in place of Wm. H. Vanderbilt, resigned. He is General Superintendent of the New York Central.

Cincinnati, Sandusky & Cleveland.—Receiver Farlow has restored the officers removed by Receiver Lea, as follows: D. W. C. Brown, General Manager; J. L. Moore, Treasurer; Charles Howard, Superintendent.

Cincinnati Southern.—The common carrier company, which has leased the finished portion of this road, has chosen the following officers: E. P. Wilson, Superintendent of Transportation and General Passenger Agent; C. M. Vanchief, General Freight Agent; J. T. Rodman, Master Mechanic and Master of Trains; W. C. Shoemaker, Secretary and Treasurer.

Columbus & Gallipolis.—At the annual meeting in Columbus,

on July 6, the following directors were chosen: Charles C. Wallcutt, E. Delatomb, C. P. L. Butler, C. H. White, S. W. Kilvert, Jr., J. C. Donaldson, John W. Baker, J. C. Harper. The board elected C. C. Wallcutt President; S. W. Kilvert, Jr., Vice-President; J. C. Donaldson, Secretary; C. P. L. Butler, Treasurer; C. H. White, General Manager.

Denver Pacific.—The following appointments have been made: F. F. Griffed, General Superintendent; B. F. Carmichael, General Freight and Passenger Agent; C. D. Smith, Auditor.

Detroit, Lansing & Northern.—Chief Engineer M. F. Thompson is appointed also Assistant Superintendent in place of J. J. Grafton, resigned.

Illinois Central.—Mr. T. J. Hudson is appointed Superintendent of the new Springfield Division, late the Galman, Clinton & Springfield Railroad. He has been Superintendent of the road for some time.

Louisville & Nashville.—Mr. J. T. Gallagher has been appointed General Baggage and Lost Car Agent.

Lockport & Buffalo.—At the annual meeting in Lockport, N. Y., July 9, the following directors were chosen: Thomas T. Flagg, Benjamin H. Fletcher, Joseph A. Ward, John Hodge, James Jackson, Jr., Benjamin Carpenter, Lewis S. Payne, Josiah H. Helmer, Elisha Moody, J. Carl Jackson, Levi F. Bowen, Isaac H. Babcock. The board elected Thomas T. Flagg President; B. H. Fletcher, Vice-President; J. A. Ward, Secretary; John Hodge, Treasurer.

Mobile & Ohio.—Mr. A. L. Rivers, General Manager, is appointed also Attorney and Agent for the Trustees and Receivers, in place of T. Haskins Du Puy, resigned.

New York, Westchester & Putnam.—The directors of this company, successor to the New York & Boston, are: Philo C. Cathoun, John H. Cheever, John W. Ells, James B. Ford, Robert H. Galloway, Wm. H. Guion, John Q. Hoyt, Grosvenor P. Lowrey, Lewis May, Christopher Meyer, Lewis Roberts, Joseph Seligman, A. V. Stout. The officers, chosen July 3, are: A. V. Stout, President; Joseph Seligman, Treasurer; Calvin Goddard, Secretary.

North Carolina.—The Governor of North Carolina has appointed the following State directors of the North Carolina Railroad Company: J. L. Morehead, A. Burwell, Charlotte; Kerr Craig, Salisbury; John A. Gray, Greensboro; J. W. Graham, Hillsboro; R. F. Huie, Raleigh; W. F. Kornegay, Goldsboro; Donald McRae, Wilmington.

Ogdensburg & Lake Champlain.—At the annual meeting in Ogdensburg, N. Y., June 27, the following directors were chosen: John C. Pratt, John S. Farlow, George M. Barnard, Isaac D. Farneworth, Francis Cox, Theodore A. Neal, Francis Thompson, Henry E. Church, S. M. Felton, Wm. J. Averell, C. T. Hurlburt, Albert Andrus, George Lewis.

Paducah & Memphis.—The purchasing trustees, Henry W. Smithers, John T. Edmunds and Charles J. Canda, have been appointed Receivers by the United States Circuit Court. They have appointed Mr. N. Monksarrat their Agent and General Manager. Communications relating to freight and passenger business should be addressed to him, as he will act also as General Freight and Passenger Agent. Mr. Wm. D. Basley is appointed Auditor. Mileage and ticket reports should be enclosed to the Auditor, who will draw for balances. Drafts for mileage and ticket balances should also be drawn upon the Auditor.

Pennsylvania Company.—The following circular is dated July 2: "Mr. Nathan Stevens is hereby appointed General Western Agent for the Pennsylvania Company and the Pittsburgh, Cincinnati & St. Louis Railway Company, and their through freight lines, with his office in St. Louis, Mo. He is charged with the general care of the freight interests of these companies at St. Louis and the territory south and west tributary thereto, and will perform such other special duties as may be required of him from time to time by the general officers of these companies."

Quebec & Lake St. John.—At the annual meeting in Quebec recently the following directors were chosen: M. W. Babie, J. D. Brosean, E. Chiniqy, N. Germain, E. Lemieux, T. A. Peddington, Frank Ross.

Selma & Gulf.—Mr. W. R. Bill has been appointed Receiver, in place of Samuel G. Jones, resigned.

Stony Brook.—At the annual meeting in Lowell, Mass., June 25, the following directors were chosen: Wm. A. Burke, Benjamin F. Clarke, James B. Francis, S. G. Mack, George F. Richardson, Joseph H. Reed, Jacob Rogers. The board elected James B. Francis, President; Jacob Rogers, Clerk and Treasurer. The road is leased to the Nashua & Lowell.

Wabash.—We are informed that the statement that Col. Samuel A. Black had been appointed Superintendent of this road is not correct, no such appointment having been made.

Western, of Minnesota.—Mr. James B. Power has been appointed Land Commissioner. He holds the same office on the Northern Pacific.

Wilmington, Columbia & Augusta.—Mr. J. F. Divine, Superintendent of the Wilmington & Weldon Railroad, is appointed Superintendent of this road also, in place of Mr. James Anderson, who has gone to the Spartanburg & Asheville road.

PERSONAL.

—Mr. Wm. L. Needham, a locomotive engineer on the Cleveland, Columbus, Cincinnati & Indianapolis Railway, General Secretary of the accident insurance association connected with the Brotherhood of Locomotive Engineers, and the inventor of a train signal used on some roads, was killed by an accident to his train July 5. A few years ago Mr. Needham was severely injured in an accident, and while laid up with his hurt prepared an accurate and concise solution of the problem of the path of a locomotive crank-pin, which was published, with many others, in the *Railroad Gazette*. This problem was taken up in England, where the celebrated mathematician and engineering author, Prof. W. J. Macqueron Rankine discussed it in the *Engineer*. If we remember right, Mr. Needham was the only one who solved the problem accurately by graphical methods; the other successful solutions were made by the use of the higher mathematics.

—Col. John Screen, President and Receiver of the Atlantic & Gulf Railroad, is one of the prominent delegates elected to the Georgia Constitutional Convention. He represents in that body the Savannah District.

—Mr. T. Haskins Du Puy has resigned his position as Attorney and Agent for the Trustees and Receivers of the Mobile & Ohio Railroad. He has taken this action in order to devote his time to the work of the Committee of Reorganization.

—Mr. Charles E. Groover, a merchant of Savannah and for many years a director of the Atlantic & Gulf Company, died of heart disease in Savannah, Ga., July 5.

—Col. James W. Woodruff, for many years connected with the New Jersey Railroad, died suddenly of paralysis at his residence in Elizabeth, N. J., July 8, aged 63 years. He entered the service of the New Jersey Railroad over 30 years ago and some years later was appointed Assistant Superintendent. After the whole line from New York to Philadelphia was put under one management, he became Paymaster of the New Jersey Railroad, and since the lease to the Pennsylvania he has been cashier in the freight department. He was a man of genial manners and was widely known and popular in New Jersey. He was noted for his fine voice and musical abilities and

for nearly 40 years led the choir in the First Presbyterian Church in Elizabeth.

—Mr. W. W. Worthington, General Superintendent of the Fort Wayne, Munce & Cincinnati road, was slightly injured by an accident on his road on the evening of July 10, an engine on which he was riding having been ditched near Eaton, Ind.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings for various periods are reported as follows:

Year ending May 31:

| | 1876-'77. | 1875-'76. | Inc. or Dec. | P. c. |
|---|-----------|-----------|--------------|-------|
| Mobile & Girard..... | \$152,895 | ..... | ..... | ..... |
| Expenses..... | 97,632 | ..... | ..... | ..... |
| Net earnings | 55,263 | ..... | ..... | ..... |
| Earnings per mile.. | 1.820 | ..... | ..... | ..... |
| Per cent. of exps... St. months ending June 30 : | 63.85 | ..... | ..... | ..... |

1877. 1876.

| | | | | |
|-------------------------------------|-------------|-------------|-------|----------------|
| Atchison, Topeka & Santa Fe..... | \$1,028,502 | \$1,046,492 | Dec.. | \$17,990 1.7 |
| Bur., Cedar Rapids & Northern..... | 428,649 | 589,235 | Dec.. | 160,586 27.3 |
| Canada Southern..... | 9,702,626 | 823,881 | Inc.. | 74,745 9.0 |
| Chicago & Alton..... | 2,035,282 | 2,246,701 | Dec.. | 211,419 9.4 |
| Chicago, Milwaukee & St. Paul..... | 2,959,460 | 3,960,517 | Dec.. | 1,001,057 25.3 |
| Indianapolis, Bloom. & Western..... | 579,460 | 769,531 | Dec.. | 190,135 24.7 |

International & Great Northern.....

| | | | | |
|--|-----------|-----------|-------|--------------|
| Missouri Pacific..... | 658,027 | 566,868 | Inc.. | 91,159 16.0 |
| Missouri, Kansas & Texas..... | 1,807,458 | 1,751,929 | Inc.. | 55,529 3.2 |
| St. Louis, Alton & T. H., Belleville Line..... | 1,430,934 | 1,417,840 | Inc.. | 13,094 0.9 |
| St. Louis, Iron Mt. & Southern..... | 1,962,277 | 1,719,386 | Inc.. | 242,891 14.1 |
| St. Louis, Kan. City & Northern..... | 1,411,222 | 1,409,756 | Dec.. | 88,534 5.9 |
| St. Louis & San Francisco..... | 612,542 | 611,310 | Inc.. | 1,232 0.2 |
| Toledo, Peoria & Warsaw..... | 498,504 | 693,385 | Dec.. | 194,881 28.1 |
| Wabash..... | 1,981,264 | 2,129,368 | Dec.. | 148,089 7.0 |

Five months ending May 31:

| | 1877. | 1876. | 1875. | 1874. |
|---------------------------|-----------|-----------|-------|--------------|
| Mobile & Ohio..... | \$737,900 | \$767,694 | Dec.. | \$29,794 3.9 |
| St. Joseph & Western..... | 150,312 | 136,283 | Inc.. | 15,029 11.1 |
| St. Louis & Southern..... | 408,262 | 401,825 | Inc.. | 6,437 1.6 |
| Net earnings | 67,117 | 52,380 | Inc.. | 14,737 28.1 |
| Per cent. of exps.. | 83.61 | 86.93 | Dec.. | 3.32 3.6 |

Month of June:

| | | | | |
|--|-----------|-----------|-------|--------------|
| Atchison, Topeka & Santa Fe..... | \$177,562 | \$187,331 | Dec.. | \$9,769 5.2 |
| Bur., Cedar Rapids & Northern..... | 69,357 | 100,700 | Dec.. | 31,343 31.1 |
| Canada Southern..... | 150,236 | 111,008 | Inc.. | 39,228 36.3 |
| Chicago, Milwaukee & St. Paul..... | 362,522 | 451,083 | Dec.. | 88,561 19.6 |
| Ind., Bloom. & Western..... | 589,000 | 877,692 | Dec.. | 288,692 32.9 |
| International & Great Northern..... | 85,090 | 126,090 | Dec.. | 44,000 34.1 |
| Missouri Pacific..... | 73,600 | 64,948 | Inc.. | 8,652 13.3 |
| Missouri, Kansas & Texas..... | 319,417 | 303,126 | Inc.. | 16,291 5.4 |
| St. Louis, Alton & T. H., Belleville Line..... | 304,300 | 252,643 | Inc.. | 51,657 20.5 |
| St. Louis, Iron Mt. & Southern..... | 171,856 | 226,720 | Dec.. | 56,864 24.9 |
| St. Louis & San Francisco..... | 97,778 | 106,612 | Dec.. | 8,834 8.3 |
| Toledo | | | | |

special class which includes "beef, pork, lard, lard oil, tallow, stearine, hams, shoulders or grease in barrels or tierces," and is taken at 5 cents less than the fourth class rate, or at the same rate as grain in bulk.

Coal Movement.

Coal tonnages for the six months ending June 30 are reported as follows, the tonnage in each case being only that originating on the line to which it is credited:

| | 1877. | 1876. | Inc. or Dec. | P. c. |
|-----------------------------------|-----------|-----------|-------------------|-------|
| Philadelphia & Reading | 2,873,528 | 1,906,990 | Inc. .. 967,538 | 50.8 |
| Northern Central, from | | | | |
| Shamokin Div. and Summit Branch | 302,669 | 378,630 | Dec. .. 75,960 | 20.1 |
| Central of N. J., Lehigh Division | 1,513,728 | 1,082,402 | Inc. .. 431,236 | 39.8 |
| Danville, Hazleton & Wilkes-Barre | 6,672 | 18,146 | Dec. .. 11,474 | 63.4 |
| Pennsylvania Can'l. | 167,180 | 136,661 | Inc. .. 30,519 | 22.3 |
| Lehigh Valley | 1,939,438 | 1,498,926 | Inc. .. 440,513 | 29.4 |
| Pennsylvania & New York | 16,374 | 12,557 | Inc. .. 14,817 | 117.6 |
| Delaware, Lackawanna & Western | 1,106,518 | 629,486 | Inc. .. 477,030 | 75.8 |
| Del. & Hudson Canal Co. | 1,107,929 | 868,105 | Inc. .. 233,624 | 26.9 |
| Pennsylvania Coal Co. | 531,144 | 430,854 | Inc. .. 100,296 | 23.3 |
| State Line & Sullivan | 6,119 | 26,351 | Dec. .. 21,232 | 80.4 |
| Total anthracite | 9,875,099 | 6,938,190 | Inc. .. 2,586,960 | 37.0 |

Semi-bituminous:

| | | | | |
|------------------------|---------|---------|-----------------|------|
| Cumberland, all lines | 677,464 | 785,334 | Dec. .. 107,870 | 13.7 |
| Huntingdon & Broad Top | 67,950 | 78,167 | Dec. .. 10,217 | 13.1 |
| Tyrone & Clearfield | 655,887 | 595,522 | Inc. .. 60,365 | 10.1 |

| | | | | |
|-----------------------|-----------|-----------|----------------|-----|
| Total semi-bituminous | 1,401,301 | 1,458,023 | Dec. .. 57,722 | 4.0 |
|-----------------------|-----------|-----------|----------------|-----|

Bituminous:

| | | | | |
|---------------|---------|---------|-------------|-----|
| Barclay R. R. | 160,409 | 161,156 | Dec. .. 747 | 0.5 |
|---------------|---------|---------|-------------|-----|

The anthracite market appears thoroughly demoralized. The great production reported in either stored up or sold at prices that must apparently entail a loss upon the companies, yet nearly all of them seem to be mining and forwarding the largest possible quantities of coal. Much of this is charged to the Reading and its efforts to force its coal into the markets heretofore occupied by other companies.

The boatmen's strike on the Chesapeake & Ohio Canal continues serious and has decreased the tonnage of Cumberland coal to considerable extent. The Clearfield shipments now approach the Cumberland nearer than ever before.

The low price of anthracite and the efforts made to find new markets for it are certainly having a bad effect on the semi-bituminous and Eastern bituminous coal trade, except in the gas coals.

The anthracite coal tonnage of the Belvidere Division, Pennsylvania Railroad, for the six months ending June 30 was:

| | 1877. | 1876. | Inc. or Dec. | P. c. |
|--|---------|---------|-----------------|-------|
| Coal Port for shipment | 10,937 | 100,920 | Dec. .. 89,983 | 89.2 |
| South Amboy for shipment | 317,371 | 203,966 | Inc. .. 113,405 | 55.6 |
| Total distribution on New Jersey lines | 85,652 | 67,729 | Inc. .. 19,923 | 26.5 |
| Company's use on New Jersey lines | 37,390 | 26,151 | Inc. .. 11,239 | 42.9 |
| Totals | 451,350 | 398,766 | Inc. .. 52,584 | 13.2 |

Of the total this year 320,195 tons were from the Lehigh and 131,155 from the Wyoming Region.

Petroleum Movement.

Stowell's *Petroleum Reporter* gives the production for May at 1,127,594 barrels of 42 gallons. Shipment from the wells 1,234,324 barrels; stock on hand, 3,173,008 barrels.

Pittsburgh shipments of refined oil for May were:

| | Barrels. |
|---|----------|
| East, by Pennsylvania R. R. | 11,145 |
| East, by Baltimore & Ohio R. R. | 58,743 |
| Richmond, by Ohio River and Chesapeake & Ohio R. R. | 22,782 |
| West, by Pitts., Cincinnati & St. L. Ry. | 1,913 |
| Total | 93,983 |

Grain Movement.

For the week ending June 30 receipts and shipments of grain of all kinds were, in bushels:

| | 1877. | 1876. | Decrease. | P. c. |
|--------------------------|-----------|-----------|-----------|-------|
| Lake ports' receipts | 2,029,977 | 3,863,510 | 1,833,533 | 47.4 |
| " " shipments | 2,627,653 | 3,605,703 | 97,050 | 27.1 |
| Atlantic ports' receipts | 2,431,213 | 4,481,981 | 2,050,768 | 45.8 |

Of the lake ports' shipments 29% per cent. were by rail this year, against 49% in 1876, 31 in 1875 and 21 1/4 in 1874. Of the receipts at Atlantic ports 59 per cent. were at New York this year, against 11 1/2 per cent. at Montreal, 9 per cent. at Philadelphia, 7% at New Orleans and 7 1/4 per cent. at Baltimore.

For the half year from Jan. 1 to June 30 receipts and shipments have been as follows, grain in bushels and flour in barrels:

| | 1877. | 1876. | Inc. or Dec. | P. c. |
|--------------------------|-----------|-----------|-------------------|-------|
| Lake ports' receipts | 1,900,176 | 2,623,048 | Dec. .. 642,872 | 24.4 |
| " " shipments | 1,997,953 | 2,789,988 | Dec. .. 972,035 | 28.4 |
| Atlantic ports' receipts | 2,234,255 | 4,475,923 | Dec. .. 1,241,668 | 27.7 |

| | Wheat: |
|--------------------------|-----------|
| Lake ports' receipts | 7,908,297 |
| " " shipments | 8,538,059 |
| Atlantic ports' receipts | 4,846,198 |

| | Corn: |
|--------------------------|------------|
| Lake ports' receipts | 34,804,507 |
| " " shipments | 27,510,402 |
| Atlantic ports' receipts | 40,550,064 |

| | All Grains: |
|--------------------------|-------------|
| Lake ports' receipts | 56,582,592 |
| " " shipments | 45,590,024 |
| Atlantic ports' receipts | 56,004,345 |

For the past four years the movement of grain of all kinds has been:

| | 1877. | 1876. | 1875. | 1874. |
|--------------------------|------------|------------|--------------------|-------|
| Lake ports' receipts | 55,582,592 | 75,365,818 | Dec. .. 19,783,226 | 25.5 |
| " " shipments | 45,590,024 | 66,325,316 | Dec. .. 20,735,292 | 31.3 |
| Atlantic ports' receipts | 56,004,345 | 77,834,922 | Dec. .. 21,830,577 | 15.5 |

THE SCRAP HEAP.

Railroad Manufactures.

The Haskell & Barker Car Co., at Michigan City, Ind., has a contract for 100 box and 100 stock cars for the Chicago, Milwaukee & St. Paul road.

The Delaware Bridge Co., of New York, has been awarded the contract for rebuilding in iron the Rockville Bridge on the Pennsylvania Railroad. This is one of the largest bridges in the United States. It carries the main line of the Pennsylvania over the Susquehanna River five miles above Harrisburg, Pa. The present structure consists of 23 spans of single track Howe truss, 160 feet each between centres of piers. The new bridge will be designed for double track, three trusses in each span, and will be entirely of wrought iron. The material will be manufactured at the Edge Moor Iron Works, at Wilmington, Del. The time for the completion of the bridge is Dec. 1, 1877.

Philip S. Justice, of Philadelphia, has just completed four of his dead-stroke power hammers for W. C. Allison & Co.

The Sancion Iron Co. put one of its furnaces at Hellertown, Pa., into blast last week.

The Joliet (Ill.) Iron & Steel Co. is running its rail mill on 56-lbs. and 52-lbs. steel rails. The iron mill is now running on shape-irons.

The Pittsburgh & McKeesport Car & Locomotive Works, at McKeesport, Pa., are building some steam motors, or dynamos, for the street railroad from Newport, Ky., to Dayton.

The Pacific Bridge Co., of San Francisco, is building a steel wire suspension bridge of 270 ft. span at Cotoneva, in Mendocino County, Cal. The wire suspension cables pass over four towers of heavy redwood timbers, and there is a wooden truss of the Howe pattern, to prevent vertical vibration. The calculated dead load of the bridge is 1,000 lbs., and the live load 2,000 lbs. per linear foot. There are 539 wires, No. 11 wire-gauge, in each cable.

The St. Louis Republican says: "Mr. C. Minnigerode, Jr., for many years past of the St. Louis Rail Fastening Co., and Mr. I. B. Adams, agent of the Springfield Iron Co., have lately formed a partnership in St. Louis for the transaction of a general brokerage business in railway supplies. Their office is on the first floor of the Merchants' Exchange building."

The Barne & Smith Manufacturing Co., of Dayton, O., have sold to the Cincinnati Southern Railroad Co. 4 passenger, 3 smoking and mail, 3 baggage and express, 50 box and 50 flat cars.

The Baldwin Locomotive Works at Philadelphia, have sold five engines to the Cincinnati Southern.

The Danforth Locomotive Works, at Paterson, N. J., have an order for several engines for the Wallkill Valley road.

Jones & Laughlin, of Pittsburgh, lately shipped a lot of shafting to Brazil.

Mr. W. P. Ward is running his ferro-manganese furnace at Carterville, Ga., very successfully, making about two tons per day of 50 per cent. ferro-manganese.

The Locomotive Brotherhood.

The July number of the *Journal of the Brotherhood of Locomotive Engineers* notes the transfer of 33 members from one "division" to another, but has no list of new members. Ten members are reported "re-instated;" 24 withdrawn to join elsewhere; one suspended for three months; and 26 expelled. Of the latter, three were expelled for "running in a strike," 13 (from a division in Reading, Pa.) are expelled "ignominiously for violating their obligations," one other for violating his obligation, four for drunkenness, three for "unbecoming conduct," one for selling liquor, and one "for defrauding brothers."

The life insurance association of the Brotherhood had 3,064 members at the end of June; the accident insurance association, 190. Wm. L. Needham, the General Secretary of the latter, was killed by an accident July 5.

An Extraordinary Train.

The Springfield (Mass.) *Republican* of July 7 tells the following story, but it seems strange that such proceedings should be allowed on a well-conducted road:

"A wonderful train came up yesterday morning at 8 o'clock from the Harlem River, which it had left Thursday noon. There were 10 platform and four box cars drawn by two antediluvian and fearfully dirty machines called locomotives, one being from the Long Island South Side and the other from Pennsylvania railroads, and bound for a Nova Scotia railroad for further service. The entire trip was a chapter of ridiculous casualties. They had a hot-box every mile, were in everybody's way, and got the boilers so full at New Haven that dirty water was shot from the stacks all over the engineer, who made a few appropriate and evangelical remarks. Out of New Haven the head-light expired, when the fireman proposed connecting the head-light with the smoke-box and using the coal-gas for illumination. At Yonkers the fuel followed the head-light, and rail-fences were ruthlessly used to get up steam, this taking an hour, which the engineer improved by fishing off the bank for crabs, and, with perhaps 60 pounds of steam the train shoved ahead with one engine, after a lively fight with local grangemen for more fence-rails. The steam gauges were broken, the lamps gone, and both driver and firemen went blind in the dark. The brakemen say they stopped at every gypsy camp to wake the folks up with blasts from the most diabolical whistle ever blown in the valley, and that the gypsies came out, young men and maidens, old men and children, and swore till the air was blue, and threw stones. When this train reached this city all bands sang the doxology, and advised the River road engineer, who took charge, to watch the wheels carefully to see which way they moved, and that an attachment was coming on for stolen fences. At last accounts the train had got to Chippewa."

An Engine Struck by Lightning.

An incident in a recent thunder storm on the line of the New York & Oswego Midland, as noticed by a passenger on a train on the road, is thus described by the *Middletown Press*:

"The train was in the vicinity of Walton. The storm was terrific. Crash after crash of thunder with blinding lightning, accompanied by a deluge of rain and hail, followed them. At one time the train seemed to be enveloped in a sheet of electrical fire. A fearful crash preceded, and instantly the engine was in a volume of electricity; balls of fire encircled the driving wheels as they revolved with lightning rapidity. Engineer Sanford beheld the phenomenon with wonder and awe, and supposing that the end of all things was at hand, involuntarily shut off the steam. Nearly every person on the train experienced a severe shock; a large tree by the track was shattered. The shock lasted but a moment. When satisfied that nothing had been injured, the engineer started the iron horse on with a loud whistle toward Norwich."

New Classification of Locomotive Engineers on the Lake Shore Road.

The following order, dated July 1, is issued over the signature of James Sedgley, General Master Mechanic:

"On and after July 1 the classes enumerated below will be established for men promoted upon locomotives. Promotions will hereafter be made from lower to higher classes, if found worthy, upon completion of the service here specified.

"The Fifth Class, consisting of engineers promoted from fire

road by the Pennsylvania Railroad Company from July 1. It will be worked as a branch of that road and attached to the Philadelphia Division. The road, which has been for several years under construction, extends from Columbia, Pa., southeast down the Susquehanna to Port Deposit, Md., 39.3 miles.

Cincinnati Southern.

A contract for the operation of the completed section of the road was concluded and signed July 3 by the trustees and the officers of the Common Carrier Company. The latter will make arrangements for working the road at once, and expects to have trains running in about two weeks.

The company has bought 5 engines, 4 passenger, 6 mail and baggage and 100 freight cars and will take 2 engines and 40 cars now belonging to the trustees. This equipment will, it is believed, be sufficient for present needs, and can be quickly increased if necessary.

Chicago, Danville & Vincennes.

At a meeting of the Indiana Division bondholders in New York, July 10, the committee reported that after long discussion they had failed to conclude any agreement with the Illinois Division bondholders, the latter refusing to admit them to a new corporation on any terms that could be considered fair, in spite of the fact that a part of the funds raised by sale of the Indiana Division bonds had been expended on the road in Illinois. The committee recommended 1. That money should be raised to pay the debts, about \$30,000; 2. That arrangements should be made for a connection with Chicago over some other road. 3. That the Raccoon Valley Branch be completed. They had no doubt that the Chicago connection could readily be secured, and that the loss of their traffic would be a serious blow to the Illinois Division.

After much discussion two members were added to the committee and it was continued with all necessary authority to act. The meeting then adjourned, subject to call of the committee.

Columbus & Hocking Valley.

The Monday Creek Branch of this road is now graded from the Main Line to Bessemer, O., three miles, and tracklaying was to be begun this week. The Snow Fork Branch is nearly graded from the Monday Creek Branch near Bessemer to the Ogden Furnace, four miles. Both branches are intended to accommodate local iron interests.

Cincinnati, Sandusky & Cleveland.

Receiver John S. Farlow has begun proceedings against James D. Lea, late Receiver, and other parties, to recover certain property of the company alleged to be still in their possession and unlawfully retained by them. He also sue for an account of the receipts of the road from April 21 to June 15, the period during which Lea held possession of the road. The amount claimed is \$72,895, for which judgment is asked. The suits will come up at the October term of the United States Circuit Court, in Cleveland.

Dividends.

Dividends have been declared as follows:

Chicago, Iowa & Nebraska (leased to Chicago & Northwestern), 5 per cent., semi-annual, payable July 2.

Lowell & Andover (leased to Boston & Maine), 3½ per cent., semi-annual, payable July 2.

Middletown, Unionville & Water Gap (leased to New Jersey Midland), 3½ per cent., semi-annual, payable July 10.

Northern (New Hampshire), 2½ per cent., semi-annual, payable July 2.

Portland, Saco & Portsmouth (leased to Eastern), 3 per cent., semi-annual, payable July 2.

Ware River (leased to Boston & Albany), 3½ per cent., semi-annual, payable July 5.

Winchester & Potowmac (leased to Baltimore & Ohio), 3 per cent., semi-annual, payable July 2.

West Chester & Philadelphia, 4 per cent., semi-annual, payable July 10.

East Mahanoy, 3 per cent., semi-annual, payable July 16; East Pennsylvania, 3 per cent., semi-annual, payable July 17; Minehill & Schuylkill Haven, 3½ per cent., semi-annual, payable July 13; Little Schuylkill, 3½ per cent., semi-annual, payable July 13; all leased to the Philadelphia & Reading.

Camden & Burlington County (leased to Pennsylvania), 3 per cent., semi-annual, payable on demand.

East Line & Red River.

This road was opened on July 4 to a new terminus at Dairfield, in Titus County, Texas, 10 miles beyond the late terminus at Hickory Hill and 30 miles northeast from Jefferson. The opening was duly celebrated.

Eastern.

In the equity suit brought by the Eastern of New Hampshire, the Eastern of Massachusetts has filed a demurrer in the United States Circuit Court, alleging that the suit is not properly brought, for the reason that the company has, by authority of the Legislature, mortgaged all its road, property and franchises to its creditors, and the mortgagees should properly be joined in the suit as defendants.

Foreclosure Sales.

The following sales of railroad property under judicial process are noted:

Detroit Eel River & Illinois, at Logansport, Ind., July 6. Purchased for \$750,000 by James F. Joy and Elijah Smith, acting for the bondholders. The road extends from Butler, Ind., southwest to Logansport, 93 miles. The latest information gives the outstanding bonded debt at \$2,064,000 first-mortgage and \$500,000 second-mortgage bonds.

Springfield, Athol & Northeastern, the northern section of 30 miles (the original Athol & Enfield) at Enfield, Mass., July 2, and the Springfield extension of 18 miles at Springfield, Mass., July 5. The property was bought in by Mr. Willis Phelps, who bid \$5,000 for the northern section, \$5,000 for the extension and \$1,000 for real estate in Springfield. The road was sold to satisfy judgments for \$117,000 for money advanced by Mr. Phelps, the sale being subject to mortgages for \$600,000, one half of which is a first lien on the 30 miles of the Athol & Enfield, the other half on the extension. The road extends from Springfield, Mass., to Athol, 48 miles.

The foreclosure sale of the Buffalo & Jamestown road, which was fixed for July 7, has been postponed until September.

Florida Central.

Counsel for the Dutch bondholders have applied to the United States Circuit Court for an injunction against this company, Milton S. Littlefield and others, to restrain them from issuing or disposing of certain bonds. It is claimed that arrangements had been made for the issue of new bonds and that an agent was to be sent to Europe to sell them at any price.

Great Western, of Canada.

A special meeting of the stockholders is called for Aug. 2, for the purpose of empowering the directors to exercise the special powers conferred by the company to make a new issue of ordinary shares in lieu of a part or the whole of the borrowing power for the purpose of paying off and redeeming the terminable bonds.

Gilman, Clinton & Springfield.

The following circular is dated June 30, and signed by C. S. Seyton, Trustee and General Manager:

"From the 1st July, 1877, this railroad is placed under the control of the Illinois Central Railroad Company.

"Agents will make all remittances on July account to Henry De Wolf, Assistant Treasurer, Illinois Central Railroad Company, Chicago.

"In making this announcement I wish to express my sense of the fidelity and efficiency manifested by the officers and employees, while the property has been under my management, and my hope that they will continue to exercise the same diligence and good will in the discharge of their duties."

The road extends from Gilman, on the Chicago Branch of the Illinois Central, southwest to Springfield, crossing the main line at Clinton, and is 111 miles long. It has been expected for some time that the Illinois Central would take it.

The road was sold under foreclosure last year and bought by the bondholders who now own it. The terms of the transfer are not made public, but it was stated at a bondholders' meeting last fall that the Illinois Central had offered for the road \$2,000,000 special stock to bear 4 per cent. interest for five years and 5 per cent. thereafter, or \$2,250,000 to bear 4 per cent. perpetually. If either of these offers has been carried out, the Illinois Central gets the road for an annual charge of from \$810 to \$900 per mile, which it can doubtless be made to earn.

Havana, Rantoul & Eastern.

This company has concluded a contract for the building of an extension from the present terminus at Alvin, Ill., on the Chicago, Danville & Vincennes, eastward to West Lebanon, Ind., about 15 miles. At West Lebanon connection will be made with the Toledo, Wabash & Western, giving the road a better outlet east than it has heretofore had.

Intercolonial.

A branch known as the East Mine Branch has been completed from this road at a point one mile from Debert, N. S., to the Canada Steel Company's mines at Folly Mountain. It is about five miles long, and is very solidly built, as it is intended to carry heavy ore trains. It was built by Hugh McIntosh, contractor, for the Canada Steel Company.

Lawtonville.

It is proposed to build a railroad from Lawtonville, S. C., to the Port Royal road near Hoover's Station, about 12 miles. The road would open up a large tract of valuable timber land.

Lake Shore & Michigan Southern.

At a meeting of the board of directors in New York, July 3, the following statement was submitted by the Auditor for the half year ending June 30, comparison being made with the similar statement made a year ago:

| | 1877. | 1876. | Inc. or Dec. | P. c. |
|--|-------------|-------------|----------------|-------|
| Gross earnings, June partly estimated..... | \$6,434,200 | \$7,004,000 | Dec. \$569,800 | 8.1 |
| Operating expenses and taxes..... | 4,709,000 | 4,594,000 | Inc. 115,000 | 2.5 |
| Net earnings..... | \$1,725,200 | \$2,410,000 | Dec. \$684,803 | 28.4 |

| | | | | |
|---|-----------|-------------|----------------|------|
| Six months' interest on funded debt, rental of leased lines and dividend on guaranteed stock..... | 1,371,000 | 1,375,000 | Dec. 4,000 | 0.3 |
| Surplus..... | \$354,200 | \$1,035,000 | Dec. \$680,800 | 65.8 |

"Included in operating expenses is the cost of about 7,000 tons of steel rails substituted for iron. By reason of the destruction of the Ashtabula Bridge, and the heavy snow storms in January and February, traffic during those months was nearly suspended. The road, machinery and property have been fully maintained in all respects, and are in first-class condition. The company has no floating debt, nor any outstanding obligations of that nature."

No dividend was declared for the half year, the surplus being less than 1 per cent. on the stock. No statement is made as to the expenses resulting from the Ashtabula accident.

Lake Superior & Mississippi.

This road was formally transferred to the new corporation organized by the purchasing bondholders, the St. Paul & Duluth Railroad Company, on July 1. From that date all accounts will be kept in the name of the new company.

Montgomery & Eufaula.

In Montgomery, Ala., July 3, the counsel for the bondholders filed an appeal to the United States Supreme Court from the order of the Circuit Court directing the sale of the road to satisfy a claim of \$60,000 held by the South & North Alabama Company. The necessary bond was filed and a supersedeas entered as to the order of sale. The foreclosure suits under the first and second mortgages have been consolidated, and, by consent of all parties except the South & North Company, an order has been entered directing the road to be sold Nov. 12, in satisfaction of both mortgages. This sale will be made subject to the rights of the South & North Alabama Company, as they may be adjudicated by the Supreme Court.

Montclair & Greenwood Lake.

The survey, lately noted, of a line from Bound Brook, N. J., to Montclair has been made by direction of this company. Three lines have been run, one from the Central, of New Jersey, near Fanwood, by Irvington and passing just west of Newark; another, also east of the Orange Mountain, through Millburn and West Orange to Montclair, and a third through the valley between the Orange and Second Mountain, striking the Montclair road near the Great Notch. The object of the parties now controlling the company is said to be to build this connection and also the northern extension of the road to the head of Greenwood Lake and then to Warwick to Montgomery, connecting there with the Walkill Valley road. That road will be taken in by lease or consolidation and the company will build, or aid in building, the connecting line from it to the Poughkeepsie Bridge. The company will then have a section of a pretty direct line from Philadelphia (by the New Line) to the Poughkeepsie Bridge; also a line by which coal from the Central can be sent to the same point. To carry out this scheme a large expenditure will be necessary; besides building the new road needed, much money must be spent on the existing road to fit it for carrying any sort of heavy traffic. The Montclair & Greenwood Lake road as it now stands is not a very valuable property, and whether it can be made one in the way proposed is an open question. The parties now controlling it can command a good deal of money and some of them ought to have sufficient knowledge of railroads to form a pretty good judgment as to whether the business to be had will warrant the expenditure required. Mr. Cyrus W. Field is now President of the company, and Hon. Samuel J. Tilden is said to have a considerable interest.

Michigan Central.

The general reduction of 10 per cent. in all salaries and wages over \$1 per day or \$30 per month was made by this company also on July 1. The company has not heretofore reduced wages as much as some others, and the employees generally have submitted quietly to the reduction.

Maple River.

Work is progressing steadily on this road, some 40 miles of grading being completed and track laid for seven miles northwest from the junction with the Chicago & Northwestern, midway between Carroll, Ia., and Arcadia. From that point the road will run northwest about 20 miles to Wall Lake, thence a little north of west about 33 miles to Battle Creek and then southwest 10 miles further to Danville. From the last named

place it is, we believe, to be hereafter extended to some point on the Sioux City & Pacific road. The road is built by the Iowa Railroad Land Company and is intended to open to settlement a large body of its lands lying between the Chicago & Northwestern and the Illinois Central roads.

New York, Westchester & Putnam.

This name was assumed by the bondholders who bought the New York & Boston Railroad at foreclosure sale over a year ago and then effected a provisional organization. A permanent organization has now been completed and the necessary certificates filed. The road, which was part of the New York, Boston & Montreal combination, is to extend from Highbridge, in New York, northward to Brewster's, about 50 miles; about half the track is laid and nearly all the rest graded.

Necedah & New Lisbon.

Work has been begun on this road from New Lisbon, Wis., on the La Crosse Division of the Chicago, Milwaukee & St. Paul, northward to Necedah, about 12 miles. A contract has been let to W. H. Cash to build complete the section from New Lisbon to a point across the Lemonweir River.

Pittsburgh, Titusville & Buffalo.

This company has sued out an injunction restraining the Pennsylvania Transportation Company from collecting by levy and sale of the property the judgment of \$220,000 which it holds against the old Oil Creek & Allegheny River Company, to which the Pittsburgh, Titusville & Buffalo is successor.

Philadelphia & Atlantic City.

This road was opened for business July 9 and trains are now running regularly. It extends from Camden, N. J., southeast across New Jersey to the well-known watering place of Atlantic City, and is everywhere parallel and close to the Camden & Atlantic Railroad, being for many miles within half a mile of that road. It is 54 miles long and of 2 ft. 6 in. gauge. The country through which it passes is not of a nature to furnish a heavy traffic and the road must depend chiefly for its business upon the heavy pleasure travel of two or three summer months. As this must be shared with the older road there will probably be a sharp competition and pretty low rates for a time at any rate.

The new road has cost about \$700,000, or about \$12,000 per mile, a low figure, but there is little or no heavy work on the line and the equipment is not heavy or expensive. In connection with the road the company will run a steam ferry between Camden and Philadelphia. The \$700,000 cost of the road is represented by \$350,000 stock and \$350,000 bonds bearing 7 per cent. interest.

Branches have been surveyed from the Main Line to Haddonfield (noted for its market gardens and fruit-farms), 1½ miles; to Leeds Point on Great Bay, 10 miles, and to Somers Point on Great Egg Harbor, 7½ miles. The branch to Haddonfield will probably be built soon; the construction of the others depends somewhat on the disposition of parties interested to take stock.

Paw Paw & South Haven.

Work is progressing on the section of this road from Paw Paw, Mich., west to Lawrence, nine miles. Tracklaying has been begun and a construction train put on the road. The company has made arrangements to lay a third rail to accommodate the narrow-gauge over the four miles of the Paw Paw Railroad, from Paw Paw to Lawton, where it connects with the Michigan Central.

Pennsylvania.

The Philadelphia *Ledger* publishes the following statement of the earnings of the Pennsylvania Railroad, including all lines east of Pittsburgh and Erie, for the five months ending May 31:

| | 1877. | 1876. | Inc. or Dec. | P. c. |
|---------------------|--------------|--------------|------------------|-------|
| Gross receipts..... | \$11,800,000 | \$13,212,000 | Dec. \$1,412,000 | 10.7 |
| Expenses..... | 7,900,000 | 9,627,000 | Dec. 1,727,000 | 17.9 |

Net earnings..... \$3,900,000 \$3,585,000 Inc. \$315,000 8.8
Per cent. of expenses 66.95 73.68 Dec. 6.73 9.1

The net decrease on the Pennsylvania Company's lines (west of Pittsburgh) to April 30 was \$150,000.

Paducah & Memphis.

The following circular is dated July 2 and signed by C. H. Allen, Receiver:

"The Paducah & Memphis Railroad has this day been delivered by C. H. Allen, Receiver, to N. Monsarrat, Agent for Henry W. Smithers, John T. Edmunds and Charles J. Canda, Purchasing Trustees and Receivers by appointment of the United States Circuit Court.

"Balances due from agents and connecting lines on business up to, and including, June 30, 1877, should be remitted, as heretofore, to C. H. Allen, Receiver, upon whom also drafts should be drawn for balances against the road, accrued up to that date.

"All accounts arising from business subsequent to the 30th day of June, 1877, should be settled with the Agent for the Purchasing Trustees in the manner indicated by him in a circular of this date."

Raleigh & Gaston.

The Treasurer is now paying, on presentation at his office in Raleigh, N. C., the \$50,000 first-mortgage bonds, which fell due July 1. Interest on these bonds ceases from that date.

Rochester & State Line.

The present contract for the completion of this road requires the work to be done by July 1. In view, however, of many vexatious delays caused by litigation, the contractor has asked for an extension of time, which will probably be granted.

Track-laying is being pushed between Machias, N. Y., and Salamanca, the object of completing this section being to get a large number of ties which have been delivered and stored near Salamanca, and which are needed for the track between Machias and Warsaw. The "dry bridge" over the Erie near Warsaw is completed; it is a trestle bridge 990 feet long and 75 feet high at the highest point. The construction train is expected to reach Salamanca before the end of July.

St. Louis & Southeastern.

The Auditor's report for the month of May is as follows:

| St. Louis Div. | Kentucky Div. | Tennessee Div. | Whole line. |
|----------------|---------------|----------------|-------------|
| \$44,417.88 | \$22,097.53 | \$12,694.59 | \$79,810.00 |
| 40,947.90 | 22,610.31 | 11,464.86 | 75,012.17 |

mouth is progressing well, nearly 30 miles being graded and ready for the ties. Some of the iron has been bought and its delivery has begun.

Sullivan County.

The board of directors of this company met in Concord, N. H., July 7, to consider the question of terminating the contract under which the road has been worked since 1866 by the Vermont Central trustees and their successor, the Central Vermont Company. It was voted unanimously to terminate the contract and Aug. 1 was fixed as the date of its expiration. The road extends from Bellows Falls, Vt., north to Windsor, 26 miles, and is on the New Hampshire side of the Connecticut, crossing that river at each terminus. It is an essential part of the Vermont Central line, connecting that road, which ends at Windsor, with the Vermont Valley at Bellows Falls. What action the Central Vermont will take in the matter is not yet known. A controlling interest in the road is owned by the Northern (New Hampshire) Company, and the present action is possibly intended to secure for that company some concessions from the Central Vermont.

St. Joseph, Washington & Western.

A company by this name has been organized to build a railroad from the St. Joseph & Western at Hanover, Kan., westward through Washington to Belleville in Republican County, about 45 miles.

Texas Western.

The running of trains on this road has ceased, owing to the financial difficulties of the company and the attachment of the engines and cars by creditors. It was expected that the July interest on the bonds would not be paid, there being no probability that the company could raise the money. In case of a default the creditors will apply promptly for a receiver and reorganize the company as soon as possible. The bonds, upon the sale of which the company relied, do not seem to have found a market.

Washington City, Virginia Midland & Great Southern.

The Receiver has announced in a circular to bondholders that the July coupons on the \$1,200,000 Orange & Alexandria second-mortgage bonds and the \$1,650,000 Orange, Alexandria & Manassas second-mortgage bonds will not be paid at present. The unpaid interest already on these bonds (not including the July coupons) is \$123,417, but the Receiver thinks there is a prospect that he may be able to pay up the arrears by October.

Western Maryland.

The July coupons on the unendorsed bonds were not paid. A circular from the company states that the net earnings have been larger than last year, but have been expended on improvements and additions necessary to preserve the business of the road.

Winnebago City & St. Paul.

The people of Winnebago City, Minn., are to vote shortly on a proposition to subscribe to the stock of this company, which proposes building a railroad from that town northward about 30 miles to a junction with the St. Paul & Sioux City near South Bend.

Wisconsin Central.

The application, noted last week, to restrain the transfer of this road to the company is made by the survivors of the firm of M. F. Seymour & Co., sub-contractors, who hold a judgment for \$107,353.46 against the Phillips & Colby Construction Company, contractors for the road. An action is pending to enforce this judgment, and the bill for the injunction is filed on the ground that the Phillips & Colby Co. has no assets except the road and its equipment and the amounts due on the contract, and if the property is transferred to the Wisconsin Central Company there will be left no assets upon which execution can be enforced. A temporary injunction was granted, but subsequently modified so as to allow the road to be operated and its earnings collected and necessary disbursements made.

ANNUAL REPORTS.

St. Paul & Sioux City.

This company owns a line from St. Paul, Minn., southwest to St. James, 122 miles; it is extended to Sioux City, Ia., by the Sioux City & St. Paul road, which has the same management and substantially the same ownership. The report is for the year ending Dec. 31, 1876.

The equipment consists of 15 engines; 6 passenger and 4 baggage and mail cars; 292 box and stock, 93 platform and 10 caboose cars; one-half interest in a business or pay car.

The company has a land grant of 927,066 acres, of which 854,429 acres have been patented to it. Of this 170,628 acres have been sold, 25,869 acres in 1876 for \$166,139.49. The receipts on land contracts were \$164,461.94, the surplus over expenses being used in canceling preferred stock and paying dividends. There are land contracts outstanding amounting to \$290,008.44.

The capital account is as follows:

| | |
|--|----------------|
| Stock (\$19,672 per mi. e.) | \$2,400,000.00 |
| Preferred and land stock and scrip (\$17,630 per mile) | 2,150,890.64 |
| Special equipment bonds | 50,000.00 |
| Bills payable and current accounts | 242,168.85 |
| Profit and loss | 29,101.93 |

Total (\$39,936 per mile) \$4,872,161.42

The special equipment bonds were issued during the year for 100 box cars bought. Progress has been made in consolidating the preferred stock, originally of four classes. During the year \$28,423.83 was added to construction account for improvements; besides the 100 box cars, \$3,844.20 was added to equipment account for a new engine, air-brakes and Miller platforms. The company owns railroad securities valued at \$98,954.75.

The work done for the year was as follows:

| | 1876. | 1875. | Inc. or Dec. | P.c. |
|--------------------------------|------------|------------|----------------|-------|
| Train mileage, passenger | 91,649 | 97,740 | Dec. 6,091 | 6.2 |
| Train mileage, freight | 164,336 | 142,519 | Inc. 21,817 | 15.3 |
| Total | 255,985 | 240,259 | Inc. 15,726 | 6.5 |
| Engine mileage | 347,704 | 341,353 | Inc. 6,381 | 1.9 |
| Passenger car mileage | 438,086 | 409,490 | Inc. 28,686 | 7.0 |
| Freight car mileage | 2,431,785 | 2,102,046 | Inc. 329,739 | 15.7 |
| Passenger carried | 59,680 | 62,538 | Dec. 2,853 | 4.6 |
| Passenger mileage | 2,725,036 | 2,563,172 | Inc. 161,864 | 6.8 |
| Tons freight carried | 196,453 | 171,306 | Dec. 25,147 | 14.7 |
| Tonnage mileage | 16,544,909 | 14,908,647 | Inc. 1,641,262 | 11.0 |
| Av. pass. train load, No. 20.0 | 25.0 | 4.0 | 15.4 | |
| Av. fr't train load, tons | 100.6 | 104.6 | Dec. 4.0 | 3.8 |
| Earn. per pass. train mile | \$1.56 | \$1.45 | Dec. .00 | 7.6 |
| Net | .08 | 0.14 | Inc. .04 | 171.4 |
| Earn. per fr't train mile | 2.62 | 2.94 | Dec. .32 | 10.9 |
| Net | 1.14 | 1.14 | Dec. .00 | |
| Earn. per pass. per mile | 4.82 cts. | 4.77 cts. | Dec. .05 cts. | 5.2 |
| Net | 1.08 | 0.99 | Inc. .09 | 175.4 |
| Earn. per ton per mile | 2.59 | 2.79 | Dec. .30 | 7.2 |
| Net | 1.12 | 1.07 | Inc. .06 | 4.7 |

The cost of engine service was 29.47 cents per mile; of passenger car repairs 2.25 cents, and of freight car repairs 0.88 cent per car mile. The road has the advantage of a traffic nearly equal in both directions, making large train-loads. Of the total tonnage 33.99 per cent. was flour and wheat and 29.65 per cent. lumber. The reduction in freight rates was caused partly by lower through rates, partly by transportation

of material at cost for the Worthington & Sioux Falls road and free for two bridges over the Minnesota River.

The earnings for the year were:

| | 1876. | 1875. | Inc. or Dec. | P.c. |
|------------------|--------------|--------------|------------------|-------|
| Freight | \$427,317.31 | \$416,932.64 | Inc. \$10,384.67 | 2.5 |
| Passengers | 123,246.85 | 122,331.30 | Inc. 1,015.65 | 0.8 |
| Mail and express | 17,630.82 | 17,705.67 | Dec. .67 | 0.4 |
| Miscellaneous | 5,656.09 | 3,143.80 | Inc. 2,511.29 | 76.10 |
| Total | \$573,758.07 | \$560,014.41 | Inc. \$13,743.66 | 2.5 |
| Expenses | 561,677.97 | 584,069.02 | Dec. 32,591.65 | 8.4 |

The net result of the year was as follows:

| | Net earnings | Inc. or Dec. | P.c. |
|----------------------|--------------|--------------|------------------|
| Net earnings | \$222,080.10 | \$175,944.79 | Inc. \$46,135.31 |
| Gross earn. per mile | 4,702.94 | 4,590.28 | Inc. 116.66 |
| Net | 1,826.33 | 1,442.17 | Inc. 378.16 |
| Per cent. of exps. | 61.3 | 68.6 | Dec. 7.3 |

The net result of the year was as follows:

| | Net earnings | Inc. or Dec. | P.c. |
|----------------------|--------------|--------------|------------------|
| Net earnings | \$222,080.10 | \$175,944.79 | Inc. \$46,135.31 |
| Real estate | 5,941.20 | 633.18 | Inc. 3,308.02 |
| Rents received | 1,190.89 | 1,401.30 | Inc. 210.41 |
| Premium and interest | 1,401.30 | | |

Total \$231,246.93

Tax on gross earnings \$11,475.16

Insurance 3,808.08

Interest on floating debt 23,708.53

Dividends on preferred stock 163,153.23

202,145.00

Profit balance \$29,101.93

Land sales were light on account of the grasshopper invasion, and the same cause affected the business of the road and will probably injure it much more during the present year. The Mississippi bridge has been partly renewed, the Rocky Point relocation of the line completed and some other improvements made. There were used in renewals 37½ tons steel and 472 tons iron rails, and 32,885 new ties. The company, jointly with the Sioux City & St. Paul, subscribed \$15,000 to the stock of the Worthington & Sioux Falls road and guaranteed \$300,000 first-mortgage and \$200,000 income bonds. That road is expected to be a valuable feeder, besides making available a large extent of the land grant not before saleable on account of its distance from a railroad.

Sioux City & St. Paul.

This company owns a line from St. James, Minn., southwest to Le Mars, Ia., 124 miles, and it leases the use of the Illinois Central track from Le Mars to Sioux City, 24 miles, making 148 miles worked. It is an extension of the St. Paul & Sioux City, has the same management and substantially the same ownership. The report is for the year ending Dec. 31, 1876.

The equipment consists of 13 engines; 6 passenger and 3 baggage cars; 255 box and stock, 93 platform and 7 caboose cars; one-half interest in a business or pay car. During the year two engines were bought and the passenger equipment fitted with the Westinghouse air-brake and Miller platform. The company has a land grant from which 415,890 acres have been patented to it, leaving 181,656 acres earned but not deeded; 90,000 acres are in dispute owing to overlapping grants. Sales during 1876 were 17,724 acres for \$106,833.32 and 35 town lots for \$4,900. The collections of the Land Department on principal and interest were \$106,408.23, of which \$99,437.28 were paid in bonds. The expenses of the Land Department were \$30,970.46.

The liabilities at the close of the year were:

| | Stock (\$22,581 per mile) | Bonds (\$21,610 per mile) | Bill and accounts payable | Profit and loss |
|---------------------------|---------------------------|---------------------------|---------------------------|-----------------|
| Stock | \$2,800,000.00 | | | |
| Bonds | 2,679,600.00 | | | |
| Bill and accounts payable | 78,888.23 | | | |
| Profit and loss | 19,413.90 | | | |

Total (\$44,988 per mile) \$5,577,902.12

Expenditures on capital account were \$33,150.04, of which \$21,166.81 was for equipment. Part of the interest accruing on the bonds has been funded and arrangements have been made to fund the coupons for 1877 and such part of those for 1878 and 1879 as the net earnings may not be sufficient to pay.

The work done was as follows:

| | 1876. | 1875. | Inc. or Dec. | P.c. |
|------------------------------|------------|-----------|----------------|-------|
| Passenger train mileage | 92,500 | 81,170 | Inc. 11,330 | 14.0 |
| Freight train mileage | 120,993 | 113,714 | Inc. 7,278 | 6.4 |
| Total | 213,493 | 194,864 | Inc. 18,609 | 9.5 |
| Locomotive mileage | 281,285 | 276,040 | Inc. 5,245 | 1.9 |
| Pass. train car mileage | 401,778 | 330,554 | Inc. 71,224 | 21.5 |
| Freight car mileage | 1,986,493 | 1,603,793 | Inc. 377,695 | 23.5 |
| Passenger carried | 24,757 | 16,006 | Inc. 8,662 | 53.8 |
| Passenger mileage | 1,753,457 | 1,472,246 | Inc. 281,211 | 19.1 |
| Tons freight carried | 124,070 | 100,382 | Inc. 23,688 | 23.6 |
| Tonnage mileage | 12,618,046 | 9,753,924 | Inc. 2,864,122 | 29.4 |
| Av. pass. train load, No. 19 | 18 | 18 | Inc. 1 | 5.6 |
| Av. fr't train load, tons | 104 | 85.77 | Inc. 18.23 | 21.3 |
| Rec'pt per pass. train mile | 30.996 | \$1.04 | Inc. \$0.04 | 4.2 |
| Net | .008 | 0.02 | Inc. 0.004 | 320.0 |
| Rec'pt per fr't train mile | 2,200 | 2.05 | Inc. 0.150 | 7.6 |
| Net | .895 | 0.66 | Inc. 0.335 | 3.6 |
| Rec'pt per pass. per mile | 4.35 cts. | 4.4 cts. | Dec. 0.00 ct. | 2.0 |
| Net | .40 | .07 | Inc. 0.33 | 471.4 |
| Receipt per ton per mile | 2.00 | 2.24 | Dec. 0.24 | 10.7 |
| Net | .75 | .61 | Inc. 0.14 | 23.0 |

Engine service cost 23.21 cents per mile; passenger car repairs were 2.75 cents and freight car repairs 0.7 cent per mile. Of the tonnage moved 29.38 per cent. was wheat and 36.81 per cent. lumber. The westward bound tonnage was 57.8 per cent. of the whole.